DOCUMENT RESUME

ED 034 018	VT 007 561

AUTHOR	Schrag, Adele F.
TITLE	Data Processing Education in the Schools of Pennsylvania, 1967-1968.
INSTITUTION	Temple Univ., Philadelphia, Pa. Dept. of Business Education.
Spons Agency	Pennsylvania State Dept. of Public Instruction, Harrisburg. Bureau of Vocational, Technical, and Continuing Education.
Pub Date	Aug 68
Note	126p.
EDRS Price	EDRS Price MF-$0.50 HC-$6.40
Descriptors	*Business Education, Community Colleges, *Data Processing, *Program Content, Secondary Schools, *State Surveys, Teacher Educators, Technical Education, University Extension, Vocational Schools
Identifiers	Pennsylvania

Abstract

All Pennsylvania high schools, vocational-technical schools, community colleges, and 2-year extensions of Pennsylvania University were studied to determine what data processing content was being taught in the schools and to assess whether a need existed to train teachers of data processing or to improve the training of those now involved in teaching classes. The first questionnaire was used to gather data about types of courses, availability of unit record equipment, availability of computers for students' use, and name of instructor; a total of 582 questionnaires (81 percent) were returned. The second questionnaire was used to secure course content, objectives, and actual utilization of equipment, and 151 of 153 forms (98 percent) were returned. Ten conclusions and seven recommendations based on the conclusions are given. (GR)

ED034018

DATA PROCESSING EDUCATION IN THE SCHOOLS OF PENNSYLVANIA, 1967-1968

AUGUST 1968

Temple University
Division of Vocational Education

Funded by
Bureau of Vocational, Technical
and Continuing Education

VT007561

Department of Public Instruction
Commonwealth of Pennsylvania

ED034018

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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DATA PROCESSING EDUCATION IN THE SCHOOLS OF PENNSYLVANIA

1967-1968

by

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Funded by
Bureau of Vocational, Technical
and Continuing Education
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Commonwealth of Pennsylvania
August 1968

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DATA PROCESSING EDUCATION IN THE SCHOOLS OF PENNSYLVANIA, 1967-1968

The first four pages of this study simply relate the events which led to a recognition of the need for procuring data (1) to determine the content being taught in data processing classes in schools of the Commonwealth; and (2) to assess the present and projected demand for teachers of data processing in the vocational programs within the State.

Detailed purpose of the study is presented on pages 8-9; the procedures used in conducting the study, pages 9-13; and the presentation of data begins on page 14.

The intention is that the information presented in this document will be used in two ways: first, in determining the need for in-service teacher training in data processing; and second, in converting the content specified for the teacher training classes into meaningful behavioral objectives to be attained in improved courses offered for future vocational teachers.

. . . .

Substantial evidence exists to illustrate the Bureau of Vocational, Technical and Continuing Education's[1] recognition of the need for preparing qualified teachers of data processing for vocational classes. First, the Bureau funded a six-week Temple University Data Processing Institute in 1966; second, they also funded a Temple University Data Processing Institute in 1967; and third, more recently the Bureau authorized funds for this study as a means of gathering information to assist in realistic future planning.

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[1] Department of Public Instruction, Commonwealth of Pennsylvania.

Background of the Problem

During 1966, twenty-four participants,[1] selected from among fifty-two applicants, spent eight hours a day, five days a week, for six weeks in the study of data processing and in the operation of unit record equipment and computers. In order to include within the program teachers whose need for cognitive learnings in data processing was most urgent, each school administrator was requested to nominate for the Institute a teacher who lacked training or experience in this area and who would be teaching data processing during 1966-1967. In addition, each person nominated completed a detailed application form supplied by and submitted to Temple University. Applicants' credentials were analyzed and selections were made for the 24 openings. Further, a "wait" list was established to be used in the event of cancellations.

Classes were held at the educational center of a manufacturer of data processing equipment. A full-time instructor supplied by Temple was assisted by the manufacturer's personnel, who taught the more technical aspects of the work. An outline of the content presented is presented in Appendix I, Exhibit 1, page I-1.

A follow-up of these 24 people in February, 1967 revealed that 23 were teaching one or more classes in data processing, and the other one was planning a detailed offering for the following year.

Because of the satisfactory feedback from school administrators and the 24 teachers served by the 1966 program, Temple University was authorized by the Bureau of Vocational, Technical and Continuing Education to plan a similar offering in 1967.

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[1] 12 technical, 8 business, and 4 mathematics teachers.

Some major improvements were initiated in the 1967 Institute, many as a result of evaluations of the 1966 Institute by the participants. First and foremost, all classes were held at Temple University rather than at the manufacturer's headquarters. Second, the Institute was lengthened by two weeks to a total of eight weeks to permit more time for maturation of learning and additional learning experiences. Two full-time instructors procured by Temple University carried full teaching responsibility. Their work was supplemented by experts invited as guest lecturers. While the same basic content was covered (Appendix I, Exhibit 1), time permitted expansions in pertinent areas.

The 1967 Data Processing Institute involved 24[1] participants selected by the procedures and criteria employed in 1966.

Experiences gained in the planning and execution of the 1966 program raised certain questions. For instance, many of those planning to teach data processing in the high school were primarily interested in the unit record aspects. Computer concepts and programming, although of informational value, held little of immediate use to them in their teaching. Moreover, each participant brought a variety of experiences to the classes--some had no background or even familiarity with data processing terminology; others had a fairly sound background and even some experiences in unit record processing but lacked the knowledge of and program application for the computer. Were all individuals being served as well as had been anticipated? For the first time the work was offered, the outline was followed for all enrollees; while in the 1967 Institute, various modifications were made as the needs arose.

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[1] 14 technical, 8 business, and 2 mathematics teachers.

In 1967 all participants were given instruction and permitted to apply their knowledge in the operation of unit record equipment; also, all enrollees studied the basic computer concepts and wrote programs. After that point, the work was individualized considerably. Those showing an aptitude for and a need of computer operation and programming moved to more advanced work; others who evidenced little aptitude for computer programming and who were planning to teach unit record concepts and operation improved their knowledges and skills in this area, still gaining some limited additional experiences in programming for the computer.

Thus, by the end of the summer of 1967, the Commonwealth had provided funds for the training of 48 additional teachers of data processing--24 in 1966 and 24 in 1967. During the 1967-1968 school year, all 48 who had been a part of the Temple Institutes were engaged in teaching data processing.

Experiences with the two Institutes indicated that certain information was lacking at the planning stages of the programs. What is being taught in the vocational data processing courses in the schools? What equipment is available for students' use? For teacher demonstrations? What are the teacher competencies? Their deficiencies? How many schools not now offering work in data processing are planning to include it within the next three years? What is a conservative estimate of the number of teachers of data processing needed in Pennsylvania within the next three years? These questions suggested a perusal of completed research in order to determine if the answers to these questions had already been found. Related studies are reported here, but none provided the answers needed. Nowhere were the answers available.

This suggested a research study covering the schools of the Commonwealth of Pennsylvania.

Related Studies

Research on the status of the teaching of data processing is scanty, partially because of the dynamics of the subject. Theoretically, schools respond to the needs of industries within the community by vocational preparation in jobs or occupational clusters demanded. Companies which were processing data by unit record equipment yesterday may by today be connected with an off-premises computer, have their own computer, or rent computer services. Equipment becomes outmoded, especially electronic equipment now in its third generation within a fifteen-year span. Also, survey data is quickly outdated.

In a study of the New Jersey Public School Districts in October, 1965,[1] 80 districts out of 578, 13.8 percent, reported using some automatic equipment. Further analysis of the study indicated that only eight of the schools used equipment other than that categorized as unit record, and no breakdown was available as to what equipment was involved. Moreover, the report presented only administrative applications and not educational use.

In October, 1966, the Department of Public Instruction of Pennsylvania issued a report[2] of a study which was to ascertain what equipment was in use in each of the institutions preparing teachers. No attempt was made to determine the utilization of the equipment as to hours per day in operation or applications. At that time only 28 institutions out of the 57 surveyed reported computers; 22 institutions reporting one computer, while among the other six were colleges having two to seven computers. Fifty-five of the colleges used unit record equipment of some type, ranging from simply the key punch up to installations with the sorter and tabulator.

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[1] M. Jack Krupnick, Research Assistant, "Summary of Survey of New Jersey Public School Districts Using Automatic Data Processing Equipment," State of New Jersey, Bureau of Research, Department of Education. Trenton, New Jersey: Report Number 263, October 1965, 9 pp.

[2] _____, "Computer and Electronic Data Processing Equipment at Pennsylvania Teacher Preparing Institutions," Commonwealth of Pennsylvania, Department of Public Instruction, Bureau of Teacher Education. Harrisburg, Pennsylvania: October 1966, 8 pp.

In a study of data processing in Bucks County, Beck[1] reported that seven out of 13 schools in the study had a data processing program in the classroom and another three schools planned to initiate a program in the future. Five of the schools which offered a program indicated its length to be two to six weeks; one school offered a six-to-nine-week program, and one school offered a course for 18 months to one year.

Of the 13 schools reporting, three had equipment available for student use and one of these reported infrequent use of the equipment by students. Of these three schools, one had the entire complement of equipment--six key punches, a verifier, sorter, IBM 402 Accounting Machine, reproducing punch, interpreter, collator and an IBM 1401 Computer. Of the other two reporting equipment, one had only a key punch machine and the other had a key punch, verifier, sorter, and IBM 402 Accounting Machine.

No analysis of utilization of the equipment by students or of content covered was made in this analysis.

Despite the fact that there are two vocational-technical schools in Bucks County, both offering rather extensive data processing training, no mention was made of the high schools using the services offered by the vocational-technical programs.

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[1] Ruth M. Beck, "A Survey of Data Processing Education Being Offered in the Business Education Departments of the Public Secondary Schools of Bucks County, Pennsylvania," undated; made available in the fall of 1967.

Although not in the category of research, a policy statement on electronic computers and their use was issued by the Pennsylvania Superintendent of Instruction in August 1966.[1] These guidelines are pertinent to the information in the current study for they apply to the high schools, area vocational-technical schools, community colleges, and state colleges of the Commonwealth. Among its guidelines was one stating:[2]

> "Each school system anticipating the introduction of electronic data processing facilities into the county, regional, administrative, or intermediate unit of the educational system and especially into an area vocational technical school, should consider the establishment of an electronic computer center with the capabilities of servicing the entire area under its jurisdiction. The electronic computer center should be operated on a time-shared basis as pre-determined by an established control unit. Federal and State funds as authorized under existing regulations will be made available to assist in establishing such a center."

Further the "Guidelines" stipulated that the programs approved for use of the computers for instructional purposes were business education, mathematics, natural science, numerical control of machines, graphic data processing, social studies, English, foreign languages, computer-assisted instruction. In addition, administrative uses were also stipulated but these do not apply to the study currently being presented.

The Problem

The problem of the Temple Data Processing Education in the Schools of Pennsylvania, 1967-1968, hereafter referred to as the DPESP Study, was to ascertain that information essential for the intelligent planning of in-service training needs of persons who plan to teach or are teaching vocational data processing courses and to collect such information in usable form.

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[1] J. R. Rackley, "General Policy Statement on Electronic Computers and The Guidelines for the Use of Electronic Computers in Vocational Education," Commonwealth of Pennsylvania, Department of Public Instruction, Harrisburg, Pennsylvania: August 15, 1966.

[2] *op. cit.*, p. 3.

Purposes of the Study

The primary purpose of the study was twofold. First, information was needed to determine what data processing content is taught in the schools of Pennsylvania; and second, whether a need exists to train additional teachers of data processing or to assist in the improvement of the training of those now involved in teaching classes in this area. Subproblems necessary to answer this two-pronged question were:

1. What data processing content is taught in the publicly-supported schools of the Commonwealth and to what objectives?
2. What unit record and electronic computers are available for teacher and student use, and how much use is now made of such equipment?
3. What are the future plans of schools not now offering data processing instruction?
4. What is the preparation, work experience, and teaching experience of teachers presently engaged in data processing?
5. What are the projected needs in the area of teacher training in data processing?

A secondary purpose of the study was to seek improvements which might be made in future Institutes (such as the 1966 and 1967 ones) to prepare and upgrade Pennsylvania teachers of data processing.

Delimitations

Analysis was confined to those high schools, vocational-technical schools, and two-year colleges within the Commonwealth which are supported by public funds. Also, only those schools responding to the questionnaires and follow-ups were included in the study. For primary analysis only those schools offering a separate data processing course were considered. Schools planning offerings were simply tabulated and are reported in that manner, even though data processing is now taught in some as a unit within another course.

Definitions

Data Processing - the handling of all paper work resulting from the production and distribution of goods and services, including classifying, sorting, calculating, comparing, summarizing, and recording.

Unit Record Equipment - electromechanical machines such as the key punch, sorter, collator, and tabulator (sometimes called the accounting machine).

Computer - an electronic device capable of accepting data and instructions, performing prescribed steps with the data, and supplying results of the operations with little human intervention once data and instructions are entered.

Procedures

Data for the main part of the DPESP Study were collected chiefly by the use of four questionnaires and by visits to selected schools.

Preliminary Questionnaire. In order to procure information vital to the data to be collected for this study, a Preliminary Questionnaire was sent to each of the high schools (637) whose name was listed in the Education Directory, Commonwealth of Pennsylvania, Department of Public Instruction, 1966-67. Forty-nine questionnaires were addressed to the principal or director of each of the existing and planned vocational-technical schools. Names of these schools were made available by the Bureau of Vocational, Technical and Continuing Education. Questionnaires were also sent to each of the community colleges and to the two-year Pennsylvania State University extensions (33). These lists were made available by the Bureau of Community Colleges and the Pennsylvania Association of Junior Colleges. Thus, a total of 719 questionnaires were forwarded to these three categories of schools.

This Preliminary Questionnaire (p. I-6), sought to identify four kinds of information: (1) schools offering data processing either as a part of an existing course or as a separate course; (2) availability of unit record equipment for students' use; (3) availability of computer for students' use; and (4) the name of the instructor charged with the responsibility for the data processing courses. After the initial mailing of the Preliminary Questionnaire, two mail follow-ups were conducted, each two weeks apart. The response was as follows:

	Number Returned	Percent of Response
High Schools	516	81
Vocational-Technical	43	87
Two-year Colleges	23	70

Thus, a total of 582 questionnaires or 81 percent of those sent out were returned.

These questionnaires were analyzed and categorized as:

	Those Offering Data Processing (part of a course or separate course)	No Data Processing Offerings	Schools in Planning Stage
High Schools	118	398	--
Vocational-Technical	19	--	24
Two-year Colleges	16	7	--

Content Questionnaire. To procure information regarding content taught, objectives, and actual utilization of equipment, a second questionnaire, considerably more detailed than the preliminary one, was sent, including: (1) the various titles of courses in data processing; (2) the grade level at which each course is offered; (3) the number of semesters' or years' duration of each course; (4) the average number of hours per week a student spends in class, on unit record, and on computer; (5) detailed content offered and objectives; (6) the models of unit record equipment and computers used in teaching; and (7) the names of all data processing teaching personnel and their particular responsibilities in data processing. (See pp. I-10-11.)

Preparation of the form involved a simple testing by data processing instructors in fifteen schools and analysis by Dr. Jay Smink, Director of the Commonwealth's Research Coordinating Unit. Suggestions for improving the form were followed and the final form was then retested by ten teachers of data processing. The questionnaire which evolved was one permitting simple checks and brief fill-ins. (Appendix I, Exhibit 4.)

The Content Questionnaire was sent to the 153 schools reporting some work in data processing--118 high schools, 19 vocational-technical, and 16 two-year colleges. Because of the nature of the information sought, the Content Questionnaire was directed to the teacher of data processing whose name appeared on Questionnaire One. Responses were excellent for of the 153 sent, 136 or 89 percent were returned from the initial mailing. Of the additional seventeen, 15 were returned after one mail follow-up and in three cases telephone calls. Thus, 151 forms out of 153 (98 percent) were returned. The high percentage of responses to the Content Questionnaire can be attributed to the tremendous interest of the teachers of data processing in reporting on their programs. Also, they realized that this information was vital to the State in its planning activities.

Analysis of the responses soon revealed that about 27 of the high school respondents to the Preliminary Questionnaire had reported inaccurate information. While data processing was alluded to in one or more of the courses, it was not taught as an entire unit or as a separate course. They were quick to clarify the erroneous responses. As might be expected, a large number of high schools offered some data processing in unit form--varying from two to eight weeks--than those offering separate courses.

In the final analysis, only 72 schools out of the 582 or 12 percent of those which returned the first questionnaire, reported the offering of a separate course in data processing. These include 8 junior-senior high schools, 31 senior high schools, 19 vocational-technical schools, and 14 two-year colleges. All data in this the DPESP Study are on these 72 schools.

Administrator's Questionnaire. The reliability of the data reported in the Content Questionnaire was provided through the closed-end type of questions. Two validation procedures were employed. First, ten respondents were visited and a validation check was made; second, an easy-to-check administrator's questionnaire was designed, prechecked, and tested. After revisions, 62 school administrators were mailed this two-page instrument. (See p. I-22.) Sixty of these were returned immediately, and a telephone check was made of the other two; thus 62 administrators responded.

From the analysis of the Administrator's Questionnaire and the Content Questionnaire, submitted by the teacher of data processing, twenty-eight schools revealed discrepancies in reporting. Either a personal visit or a telephone call to the administrator permitted clarification to correct erroneous data reported. It can be assumed with assurance that data reported in this study are valid.

Instructor's Questionnaire. Names of all instructors in data processing were requested on the Content Questionnaire. Each was mailed a letter and questionnaire to be completed and returned to the investigator. Information sought included the educational background, special data processing courses or institutes attended, data processing work experience, titles of courses now being taught in data processing, and the expression of the instructor's opinion as to the need for additional formal training and work experience in data processing. (See pp. I-24-26.) Among the 72 schools offering the separate course or courses, 114 instructors were sent this questionnaire, and 84 responded. Because of the personal nature of the information sought and the free expression of opinion requested, no follow-up was conducted among the nonrespondents.

Analysis of Data

The Preliminary Questionnaire was hand tabulated; however the data from the Content Questionnaire, because of its complexities, were converted into code and punched into six punch cards for each responding school. Data were then sorted and tabulated by unit record equipment.

The status type of study undertaken did not lend itself to the statistical analysis of the data other than the presentation of percentages at appropriate points. Thus, the data presented in this study are simply that of a status of the teaching of data processing--content covered and objectives sought and the equipment used during the school year, 1967-1968.

FINDINGS OF THE DPESP STUDY

Data processing courses are available in seventy-two publicly-supported schools of Pennsylvania. (See Figure 1, Appendix II, pp. II-45 to II-47.) These schools reported offering at least one separate data processing course in 1967-1968, and more schools indicated their plans for the addition of such courses.

Schools Offering Separate Courses

The number of courses offered varies from one, offered by 36 schools to nine, offered by two community colleges. Schools which reported course offerings in Table 1 include 8 junior-senior high schools, 31 senior high schools, 19 vocational-technical schools, and 14 two-year colleges. Table 1 and Appendix II, Table 1, report the junior-senior high and the senior high schools separately, but since there are no significant differences which reflect the organizational structure, the two are treated as one category in other tables and in the context of this report.

TABLE 1

KIND OF SCHOOL BY NUMBER OF SEPARATE DATA PROCESSING COURSES OFFERED

	Total No. Schools	Number of Courses								
		1	2	3	4	5	6	7	8	9
Junior-Senior	8	7	-	1	-	-	-	-	-	-
Senior High	31	21	9	1	-	-	-	-	-	-
Vocational-Technical	19	8	7	2	2	-	-	-	-	-
Two-year Colleges	14	-	1	2	1	2	4	1	1	2

Figure 1 depicts the geographic locations of the 72 schools for which data are presented in this study. As might be expected, clusters of counties within approximately seventy miles of the urban centers of Pittsburgh and Philadelphia account for 80 percent of the schools.

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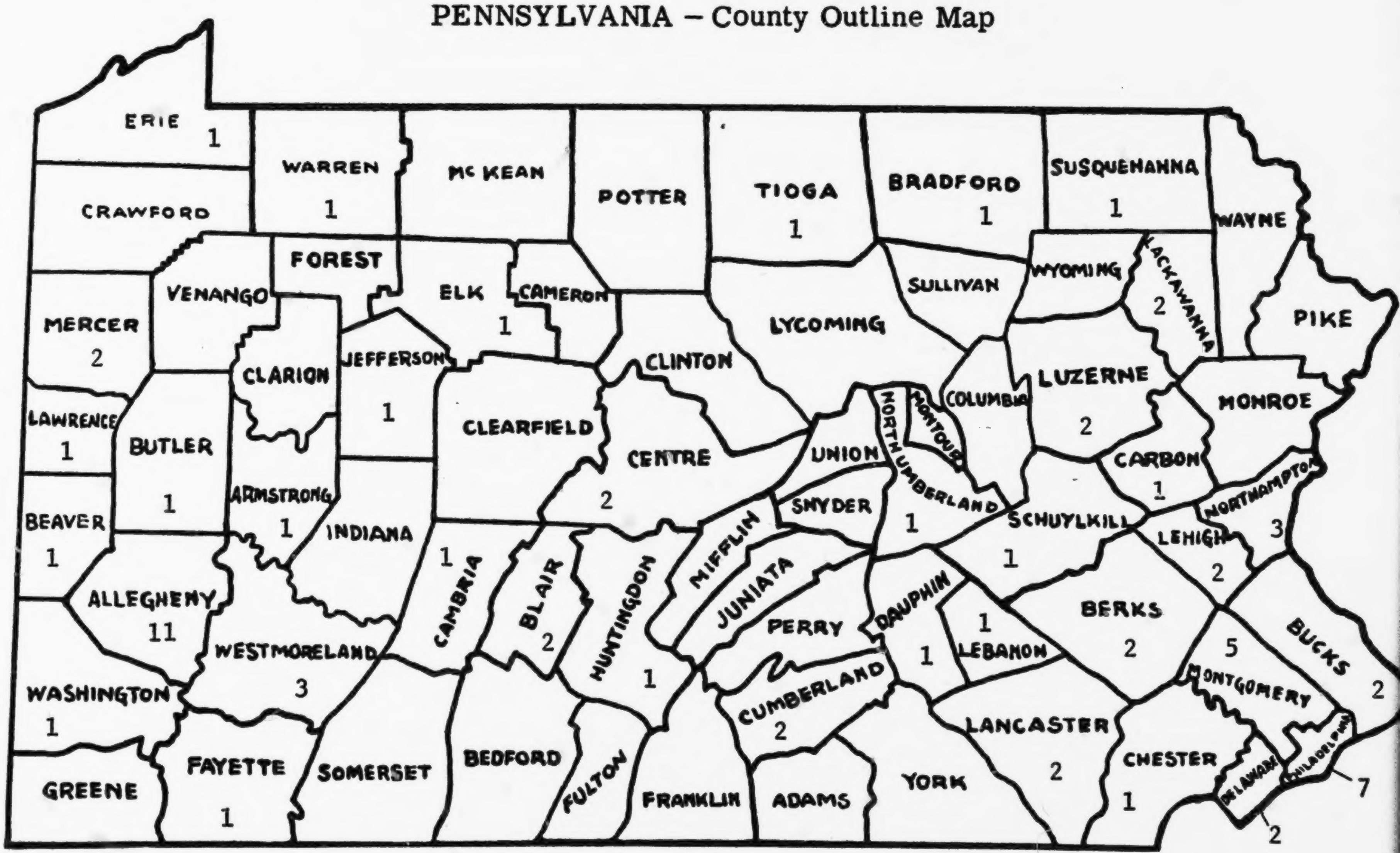
PENNSYLVANIA – County Outline Map

ERIE 1
CRAWFORD
WARREN 1
Mc KEAN
POTTER
TIOGA 1
BRADFORD 1
SUSQUEHANNA 1
WAYNE
MERCER 2
VENANGO
FOREST
ELK 1
CAMERON
CLINTON
LYCOMING
SULLIVAN
WYOMING
LACKAWANNA 2
PIKE
LAWRENCE 1
BUTLER 1
CLARION
JEFFERSON 1
CLEARFIELD
CENTRE 2
UNION
NORTHUMBERLAND 1
MONTOUR
COLUMBIA
LUZERNE 2
MONROE
CARBON 1
BEAVER 1
ARMSTRONG 1
INDIANA
SNYDER
SCHUYLKILL 1
NORTHAMPTON 3
LEHIGH 2
ALLEGHENY 11
CAMBRIA 1
BLAIR 2
HUNTINGDON 1
MIFFLIN
JUNIATA
PERRY
DAUPHIN 1
LEBANON 1
BERKS 2
BUCKS 2
WESTMORELAND 3
MONTGOMERY 5
WASHINGTON 1
CUMBERLAND 2
LANCASTER 2
CHESTER 1
PHILADELPHIA 7
DELAWARE 2
GREENE
FAYETTE 1
SOMERSET
BEDFORD
FULTON
FRANKLIN
ADAMS
YORK

FIGURE 1

GEOGRAPHIC LOCATION OF SCHOOLS IN STUDY

Twenty-two schools (30 percent) are located in the nine counties surrounding Pittsburgh, and 26 schools (36 percent) are in the nine counties within seventy miles of Philadelphia.

Although all significant data are included in this study, detailed tables which consume multiple pages are found in Appendix II. Data from these tables are analyzed in the following text.

Titles of Courses by Grade by Duration

Senior High Schools. The eight junior-senior high schools and 31 senior high schools are analyzed as a group. Table II-1, pp. I-4 to I-10, provides evidence that "data processing" is commonly accepted as nomenclature for course titles, especially among the high schools. Twenty-eight of the high schools (72 percent) reported at least one course with "data processing" in the title. Actually, the titles portray little of the course contents, which are shown in detail in Tables II-2, 3, and 4, pp. II-11 to II-40. In some high schools the data processing title covers only unit record concepts and no work on equipment; in others using the same title, unit record and computer concepts are both covered and there may be hands-on time on equipment.

"Computer programming" or in one case "FORTRAN" appears in course titles of seven high schools; another uses the label "computer mathematics" and another, "engineering concepts."

The pattern of grade level is well established, as might be predicted. Work is offered in either the eleventh or twelfth grades, except in two schools which begin offerings in the tenth grade.

One-half year to one year is the commonly accepted length of these courses in 39 of the high schools. One school reported the offering of "computer programming" for three years beginning in the tenth grade; however, further investigation revealed that not all programming students were expected to take advantage of the full program. Some take only one year of programming.

Analysis of hours in class and on equipment reveals a variation from a low of two hours a week per student (one hour in class and one hour on unit record equipment) to a high of ten hours a week in class and on equipment. The information reported indicates that 11 schools have no student access to either unit record equipment or a computer; 24 high schools (62 percent) offer hands-on time on unit record equipment; and 13 high schools (33 percent) make computers available for some degree of program running and/or computer operation.

There is no discernible pattern for hours in class and on equipment; also, many schools reported that individual students may spend additional out-of-class hours on equipment.

It is important to point out that to perform operations on a program, a student may feed data into a computer, have it processed, and receive results within only seconds or minutes. Therefore, he needs only a limited time for computer access. On the other hand, if the course objective is computer operation, the student needs hours of experience in perfecting skills, in reading lights, and in interpreting signals of the machines. Among the 13 high schools which reported hands-on the computer, the time varies from fifteen minutes a week to two hours a week per student. Thus, it is likely that the one school reporting two hours on computers may have objectives which differ somewhat from other schools reporting simply minutes on the computer.

Vocational-Technical Schools. Course titles among these 19 schools involve the term "data processing" with 16 (84 percent) reporting a course using the term. Moreover, seven of the schools subdivide data processing into I and II or use the terms "scientific" or "business" data processing. As with the high schools, many of the titles reveal little of the contents therein. Four schools (Nos. 48, 51, 57, and 58) presented titles which are more descriptive of what might be found within the courses.

As would be expected, schools reported here show equipment-use experiences different from the high schools. Only one vocational school (No. 56) reported no student access to any equipment. Among the other 18 schools, two reported no student access to unit record equipment (Nos. 52 and 57), and two reported no student use of a computer (Nos. 42 and 55).

Five vocational schools reported offerings only on the post-high school level, and one reported both a post-high course and two courses offered to the high school student. There is no evidence of a trend as to level of course offering. It appears that the needs of individual schools and their communities help determine the level of course placement. Also, from conversations with administrators it was affirmed that administrative philosophies strongly affect the level of such courses.

Since much of the work in these schools is an inseparable combination of class and equipment time, it is well to view the three items as a whole rather than to segment them. While the total hours per week per student were considerably greater than for the high schools, time spent in data processing courses by vocational school students varies. Some schools indicated one to seven hours per week (Nos. 46, and 58); others reported as high as 21 to 30 hours (Nos. 49, 54, and 55). Six schools reported offering in class and equipment time of 15 hours per week per student.

Community Colleges. The most expansive course offerings are found among the two-year colleges where the course titles are varied and somewhat more descriptive of the contents that are the vocational school and high school titles. One explanation for this is the probable offering of a data processing curriculum for specialization, necessitating a core of courses.

Course title emphasis at this level is on the computer with programming and systems stressed. Only one college (No. 64) reported no equipment for student use, yet they also reported that data to be processed were sent to another campus for feeding into a computer. Also No. 67 reported having programs run by a computer outside the college.

Length of time per course varied from a quarter to a year, with the semester or half year the most frequently reported.

Hours per week followed the traditional pattern of the colleges with ten of the fourteen schools reporting three clock hours per week in class. Eight of the schools varied the hours per week for given courses. Time actually spent on equipment for the colleges was significantly lower than for the vocational schools but the reason for this cannot be evaluated because the course objectives are not revealed here. The pattern appears to be concentration in classes on theory with some time set aside for application to equipment, whereas the vocational schools because of their objectives to train technicians tend to have more time spent in the operation of equipment.

Content Covered by Objective--High Schools

Unit Record. Appendix II, Table 2, pp. II-11 to II-20, reveals a lack of consensus among the high schools as to the objectives of content taught in data processing. More than half of the 39 high schools (51.3 percent to 59.0 percent) reported striving for vocational competence in those aspects of unit record associated with key punching. (See Unit Record, p. II-11 and The Card Punch and Verifier, p. II-12.) This would suggest that these schools strive to prepare key punch operators for employment.

Over 87 percent of the high schools offering the separate data processing course(s) reported an effort to have students familiar with the machine functions such as recording, classifying, calculating, interpreting, report preparation, and storing. (See p. II-11.) Although only about forty percent indicated working for vocational competency in this area, emphasis was given to these functions by all except 12.8 percent of the high schools.

Understanding of the business organization is essential in relating the processing of data to the organization, and more than fifty percent of the reporting schools include this in their course content. While only 12.8 percent stated vocational competence as the objectives for the "systems concept," 46.2 percent reported the concept as pertinent background information presented to students.

Almost half of the high schools presented the vocational competency objective for the sorter and its operation. Also, 34 or 87.2 percent of the 39 schools indicated some familiarization with the functions of the sorter in their courses. Since the interpreter is not always found in a unit record equipment installation, it is noted that less than eighteen percent of the high schools reported vocational competence as the objective for this piece of equipment. However, no less than 27 of the 39 high schools (69.2 percent) reported including some understanding of the interpreter's operation in the content presented.

An important part of the unit record process is the tabulator, or accounting machine as it is sometimes called. Eighty-seven percent of the high schools reported giving at least an understanding of this machine's functions to their students, and 43.6 percent of these aimed at vocational competence. Forty-one percent stated vocational competency of the program control (a wired board), necessitating wiring of multiple panels if a student is to achieve expertise and confidence in the process.

Computers. Between 4 and 7 high schools aimed toward vocational competence in the components of electronic systems, while no less than 27 of the 39 schools (69 percent) gave at least an understanding of the stored program concept. Twelve schools (32 percent) made no effort to include this concept in the material presented to their students (p. II-14.)

One of the basic understandings of computer systems is their similarity in function to manual, mechanical, and electromechanical systems, yet only 20 schools (51 percent) included these understandings in the course content. (p. II-14.)

Input-output media for computers vary, yet multiple variations were made some part of the course content among no less than 25 of the 39 schools, (64 percent). Magnetic character sensing which is becoming an important part of the consumer's business affairs was presented by 61.6 percent of the schools.

Although only 6 to 8 schools endeavored to accomplish competence among the high school students in the concepts of internal processing of the computer, 16 to 20 schools (41.1 percent to 51.3 percent) reported provision for basic understandings in this area.

Among the high schools, less than a handful (one to five) provided for vocational competence in those elements relating to programming. (See Organization of the Data Processing Components, p. II-16.) Just about half of the high schools endeavored to provide basic understandings in this phase of the computer work.

One to three high schools reported aiming for vocational competence in programming in the various languages; for instance, 2 which reported vocational competence used COBOL; 3, Fortran II; 3, Fortran IV; 1, Autocoder; 1, SPS; 1, general assembly language; 1, LPG 30; and 1, machine language. In all, 12 different schools reported their endeavors toward giving students some competence in at least one programming language. Also, 11 schools (including seven of those which reported vocational competence above) reported the inclusion of some basic understandings of programming. In addition to the six languages provided for background information on p. II-20, other languages used by schools were basic machine language, Quicktran, and a general assembly language.

When all of the data are analyzed, it becomes apparent that 16 of the 39 high schools (41 percent) make an effort to present some aspects of programming. This signifies that 59 percent are ignoring even basic understandings of programming languages.

Content Covered by Objective--Vocational-Technical Schools

Appendix II-Table 3, pp. II-21 to II-30, reveals evidence that these schools have a carefully thought out philosophy and are moving toward evaluating the ultimate objectives when determining course content.

All except one vocational-technical school reported some effort toward giving the students an understanding of the business organization. In fact, 18 of the 19 schools reported the inclusion of the "systems concept" as a part of the content.

As would be expected, 100 percent of these schools aimed toward vocational competence in the use of the unit-record (punched card as a means of input). Sixteen to 17 of the schools reported striving for vocational competency in the various machine functions.

Although not all schools in this category reported time on unit record equipment (Table 2) 94.7 percent (18 schools) indicated the card punch and its verification as a vocational objective. (See Table II-3, p. II-22.)

The sorter is considered a vital component to data processing by these schools and was reported as a vocational objective by 94.7 percent of the 19 schools.

Examination of the tabulator data on p. II-23 ties in with the data reported in Table 1, for 15 schools (78.9 percent) checked vocational competence as the goal for this part of the equipment. In addition, one school sought to give basic understandings as to the functions of the tabulator. Thus, only three schools reported no content coverage for the tabulator.

Computers. It is evident from an examination of p. II-24 that the vocational-technical schools strive to emphasize the components of the computer system, 13 schools (68.4 percent) reported the vocational objective for the stored program concept. In fact, only one school of the 19 did not include this as a basic part of the course content.

About seventy percent of the vocational-technical schools reported the coverage of the difference between the manual, mechanical, and electromechanical systems as an item of content. In fact, no less than 47.4 percent of the schools included vocational competence as the goal for these items. This is contrasted with only about fifty percent of the high schools which made an effort to include these differences as a part of the content presented.

All but one or two of these schools reported giving some emphasis to varied media for input-output.

All except three or four of the vocational-technical schools indicated striving for understandings or competency in the aspects of programming outlined on p. II-26. In fact, 68.4 percent reported the vocational objective for instruction format and another ten percent included it as a vital part of the content. Data flow was reported as a vocational objective by 68.4 percent (13 of the 19 schools).

One area, that of program testing on p. II-28, suggests that fewer of the vocational schools than might be expected are providing for competence in program testing. Program testing is vital to those who aspire to enter the field of programming. A possible explanation of this might be that those schools reporting only the background informational objective here or those reporting the information is not covered may not have students whose logical abilities permit concentration in this area. The philosophies of many of the vocational schools is to take the individual student as far as he can go. If the student is limited in a variety of ways, the instructors may provide the opportunity for him to become more competent in those areas he can master.

A substantially greater proportion of the vocational schools reported providing instruction in programming languages than did the high schools.

Six of the 19 schools (31.6 percent) reported the vocational competence goal for Fortran II; 4, COBOL; 4, SPS; 3, Fortran IV; 3, Autocoder; 2, PL-1; and 1, Neat. In addition to those languages in Appendix II, Table 3, 4 schools reported the vocational competence objective for vocational students in RPG: 4, basic machine language; 1, Easy Code; and 1, general assembly language. Actually, 17 of the 19 vocational schools (89 percent) reported the presentation of some programming language. Among these were 14 schools (74 percent) which reported at least one language for vocational competency and 9 schools which reported at least one language for background information. There were only two vocational schools which did not indicate the teaching of any programming language at this time.

In summary, a considerably greater proportion of the vocational schools reported the vocational objective for content items (including programming languages) than did the high schools. This, of course, is in keeping with the objectives which these schools are expected to achieve.

Content Covered by Objective--Two-Year Colleges

Unit Record. As in the vocational schools, the two-year colleges emphasize the business organization's functions to an extent greater than the high schools, 78.6 percent reported giving some understanding of the systems concept as either background knowledge or for vocational competence.

The unit record concept was reported by 64.3 percent for vocational purposes and by 21.4 percent as part of the basic knowledges. Although only about half of the community colleges indicated vocational competence as the objective for the card punch and verifier, another 28.6 percent of the schools provided this as part of the background content. Thus, twelve of the fourteen schools included some phase of the card punch which results in the basic unit record concept.

In analyzing other items of unit record on Appendix II, Table 4, pp. II-31 to II-40, it is obvious that about half of the colleges reported the vocational objective for machines in this classification. In fact, for the tabulator the vocational objective was reported by only 6 or 42.9 percent of the 14 colleges.

Computers. Greater emphasis is given in the two-year colleges to the computer and other elements of electronic data processing than to unit record.

All except one community college reported attention to the components of an electronic system. The question of objective--vocational or background knowledge--seems to be rather consistent, for close to seventy percent of the colleges reported a vocational objective.

All except three of the 14 colleges reported attention to the variations among manual, mechanical, and electromechanical systems.

Multiple input-output media are emphasized by the two-year colleges, 11 to 13 (78 percent to 93 percent) including such in the course content.

All except one of the two-year colleges concentrates in the area of organization of data processing, for up to 78 percent reported vocational level of competence in one of the areas outlined and no less than 7 percent included the items as part of the content for background information. For instance, instruction format was reported for vocational competence by 71.4 percent and as background information for 21.4 percent.

Various aspects of program testing for vocational competence were reported by 71.4 percent to 78.6 percent of the 14 schools. A question arises why the other two schools which included "instruction format" reported no attempt at providing for testing of programs. The reporting would seem to suggest that students of these two colleges write the programs and run them but are not given the opportunity to analyze their problems and ascertain the source of errors. Another possible explanation may be that some of these college programs are so new that experiences of this year reported will not necessarily be those of the second year of the program.

Nine two-year colleges provide a vocational objective for program writing in COBOL; 6, Fortran II; 7, Fortran IV; 6, Autocoder; 6, SPS; 3, RPG; 2, basic machine language; and 1, PL-1. Two schools (14 percent) reported no inclusion of a programming language, whether for background knowledge or proficiency.

Scientific vs. Business Applications

Because data reported on the Content Questionnaire indicated that little content differentiation was shown between business and scientific data processing and course titles did not clearly depict contents, more information was sought. On the Administrator's Questionnaire (p. I-22), respondents were asked to indicate what kinds of applications were processed by the computer system--business and/or scientific. In virtually all of the vocational schools and two-year colleges having computers, administrators reported parallel applications. Fewer high schools indicated scientific, or mathematics as they labeled it, than business applications.

	Applications				
	Scientific		Business		Schools Reporting Computers
	Yes	No	Yes	No	
High School	6	33	11	28	11
Vocational-Technical	13	1	14	--	14
Two-year Colleges	10	2	12	--	12

Unit Record Equipment Reported

For purposes of discussion here, those schools having simply one or more key punches and no other unit record equipment are eliminated from the following analysis. Also eliminated from the discussion are schools which reported the simulator instead of the key punch. These schools were tabulated under "None."

High Schools. Twenty-eight (72 percent) of the high schools reported the use of one to seven key punches, and one school reported 19. (See Table 2.) The sorter was indicated as available to 22 of the high schools (56 percent). Since unit record equipment can process data with no collator, it is not surprising that only 11 (28 percent) of the high schools reported this piece of unit record equipment. The interpreter falls into the same category as the collator with 9 schools (23 percent) indicating this equipment.

Combinations of unit record equipment shown in Table 3 indicate no pattern of acceptance for the high schools. Excluding the 11 schools with no key punch and the three which reported a key punch, 25 schools (64 percent) have some combination of unit record equipment in their installations. The most frequently reported combination was the "key punch, sorter, collator, interpreter, reproducer, and tabulator" combination, a complete unit record installation capable of handling any kind of application was reported by 7 (18 percent) of the high schools.

Vocational Schools. All vocational schools reported at least one key punch machine and one sorter. In the case of the key punch, the numbers reported by schools varied from one to 21. (See Table 2.) Although a significantly higher percentage of vocational schools than high schools reported collators, interpreters, and reproducers, it is evident that

TABLE 2

KIND OF SCHOOL BY UNIT RECORD EQUIPMENT AVAILABLE FOR STUDENT USE

Kind of School	Total	Key Punch					
		none	1	2	3-4	5-7	8 or more
Senior High	39	11	15	5	4	3	1[1]
Vocational-Technical	19	--	3	2	3	7	4[2]
Two-Year Colleges	14	--	4	5	4	1	-

Kind of School	Total	Sorter			Collator		
		none	1	2	none	1	2
Senior High	39	16	22	1	28	11	-
Vocational-Technical	19	--	18	1	5	13	1
Two-Year Colleges	14	3	10	1	7	7	-

Kind of School	Total	Interpreter		Reproducer		Tabulator	
		none	1	none	1	none	1
Senior High	39	30	9	23	16	18	21
Vocational-Technical	19	13	6	3	16	4	15
Two-Year Colleges	14	7	7	8	6	5	9

---

[1] 19 key punches

[2] Includes 18 in one school and 21 in another

these are not considered to be essentials in the machine's classroom. The tabulator was reported by 15 (79 percent) of the vocational schools. Thus, four vocational schools reported operating without means of print-out for reports.

Analysis of the vocational schools in Table 3 reveals a higher concentration (12 schools or 63 percent of the vocational schools) possessing four or five components of equipment than the high schools. This, of course, signifies that these schools have equipment which is compatible with their general objective of providing vocational training.

Two-Year Colleges. All of the colleges reported key punch machines, collators, and interpreters. (Table 2.) Sixty-four percent (9) of the two-year colleges reported tabulators compared with 79 percent (11) indicating possession of a sorter. A possible explanation can be gleaned from an examination of Appendix II, Table 4, p. II-33, showing only 6 colleges (43 percent) reporting the vocational objective for tabulator functions and p. II-37 as high as 86 percent reporting vocational objectives in work involved with card systems for the computer. Obviously more of the colleges are concerned with computer operation and applications than with the tabulator. Moreover, the sorter is equipment essential to punched card input for a computer.

Table 3's tabulation of combinations of unit record reveals that 11 schools (79 percent) possess some components in addition to the basic key punch. Once more, the five combination of key punch, sorter, collator, interpreter, reproducer, and tabulator was reported most frequently--5 schools (36 percent).

Computers. Much lower numbers are evident in Table 4, which presents the numbers of schools providing student access to computers. Of the high

TABLE 3

KIND OF SCHOOL BY UNIT RECORD COMBINATIONS

Kind of School	Total	None	Key Punch Only	Key Punch and Sorter	KP, Sorter, & Tabulator	KP, Sorter, Collator, Reproducer & Tabulator	KP, Sorter, Collator, Interpreter, Reproducer, & Tabulator	KP, Sorter, Reproducer, & Tabulator	Key Punch and Collator	KP, Sorter, Collator, & Tabulator	Other Combinations
Senior High	39	11	3	4	3	3	7	5	1	1	1[1]
Vocational-Technical	19	--	-	2	-	7	5	2	-	-	3[2]
Two-Year College	14	--	3	1	1	1	5	-	-	2	1[3]

---

[1] Key punch, sorter, interpreter, reproducer, and tabulator.
[2] One - Key punch, sorter, interpreter, and reproducer.
One - Key punch, sorter, collator, and tabulator.
One - Key punch, sorter, collator, and reproducer.
[3] Key punch, sorter, and collator.

TABLE 4

COMPUTERS

Kind of School	No. Schools Reporting Computers	IBM 360	IBM 1620	IBM 1400	IBM 1130	IBM 7000	GE 235	GE 225	GE 215	Honeywell 200	NCR 315-100	LGP 30
nior High	11[1]	-	3	1[2]	1	2[3]	1	3[4]	1[4]	-	-	1
cational-Technical	14	-	3	5[5]	2	-	-	2	-	1	1	-
o-Year Colleges	12	7[6]	1	3[7]	1	-	-	-	-	-	-	-

---

[1] Two schools each reported two computers, or 13 computers in 11 schools.
[2] 1401
[3] 7044 and 7740 -- both in same school.
[4] One school reported one GE 225 and one GE 215.
[5] Three IBM 1401; one, 1440; one 1460.
[6] Three IBM 360-67; four, 360-30.
[7] 1401

TABLE 5

KIND OF SCHOOL BY OBJECTIVE BY EQUIPMENT

Kind of School	Unit Record								
	Objective for Card Punch	Key Punch		Objective for Sorter Functions	Sorter		Objective for Tabulator Functions	Tabulator	
		Available	None		Available	None		Available	None
Senior High School									
Not Covered or NR[1]	2	-	2	5	-	5	5	-	5
Background Information	16	9	7	15	6	9	17	9	8
Vocational Competency	21	19	2	19	17	2	17	12	5
Vocational-Technical									
Not Covered or NR[1]	-	-	-	-	-	-	3	1	2
Background Information	1	1	-	1	1	-	1	-	1
Vocational Competency	18	18	-	18	18	-	15	14	1
Two-Year College									
Not Covered or NR[1]	2	2	-	3	2	1	4	2	2
Background Information	4	4	-	3	1	2	3	1	2
Vocational Competency	8	8	-	8	8	-	6	6	-

[1] No Response - See Appendix II, Tables 2, 3, and 4 for specific breakdowns.

TABLE 5 continued

KIND OF SCHOOL BY OBJECTIVE BY EQUIPMENT

	Computer								
Kind of School	Objective for Computer Functions	Computer		Objective for Programming a Tape System	Computer		Objective for Programming a Random Access System	Computer	
		Available	None		Available	None		Available	None
Senior High									
Not Covered or NR[1]	18	1	17	33	8	25	34	8	26
Background Information	18	8	10	1	-	1	4	2	2
Vocational Competency	3	2	1	5	3	2	1	1	-
Vocational-Technical									
Not Covered or NR[1]	4	3	1	6	2	4	8	4	4
Background Information	5	4	1	7	7	-	4	4	-
Vocational Competency	10	10	-	6	6	-	7	7	-
Two-Year College									
Not Covered or NR[1]	1	1	-	4	4	-	4	4	-
Background Information	6	4	2	5	4	1	1	1	-
Vocational Competency	7	7	-	5	4	1	9	7	2

---

[1] No Response - See Appendix II, Tables 2, 3, and 4 for specific breakdowns.

schools, only 11 or 28 percent reported having direct access to computers. Two other schools in this category indicated the access to a terminal, connected to a computer. The data did not indicate whether the terminals were used simply to give the students an opportunity to feed a program into the computer or whether they were actually used to run a problem through the system and make corrections in the program as needed. Among the vocational schools, 14 or 74 percent reported providing computer access and 86 percent of the colleges (12) indicated computer access. Table 4 also gives data regarding the kind of computer installation in the schools. Of the 39 computers reported, 74 percent (29) were those of one manufacturer.

Content Objective by Equipment. In another validation check of the data reported, cross tabulations of selected question responses on content to that of related equipment were made. For instance, a school which reported a vocational objective for key punch would be expected to have the machines in order to provide for student skill development and knowledges of operations. Results of these cross tabulations reveal some inconsistencies among the high schools reporting. (See Table 5.) Of the 21 high schools which reported the vocational competency objective for key punches, 2 schools did not even provide key punches for their students. The same was true among the high schools reporting the sorter for vocational competency, for 2 of the 19 schools involved here did not provide access to a sorter; also, five of the 17 schools which indicated vocational objectives for the tabulator failed to report access to this equipment.

The objectives and the equipment reported by the vocational schools are more consistent, for only in the case of one vocational school was the vocational objective reported with no availability of equipment. (See Table 5, Tabulator.)

Of those reporting in this study, the two-year colleges had one hundred percent of their objectives of a vocational nature backed by equipment related to expressed goals.

Analysis of selected content areas with the computer also raised such questions as how much vocational competency can be gained in programming for either a tape system or random access system without some opportunity to run the programs and study the kinds of data resulting from the programs. The vocational schools reported objectives consistent with the equipment access afforded the students; however, the high schools and two-year colleges provided data which, if correctly reported, should signify a re-examination of their objectives in the light of the machine time provided. For instance, five high schools signified programming for vocational competency on a tape system, yet only three schools reported access to a computer; also, five colleges reported the same objective and one of these colleges indicated no computer access. Nine colleges reported vocational objectives for programming a random access system, but two reported no computers available.

Instructors of Data Processing

Of the 84 teachers responding to this questionnaire, 43 reported from the high schools, 18 from the vocational-technical schools, and 23 from the two-year colleges. (See questionnaire, Appendix I, pp. I-25-26.)

Seventy-six or 90 percent possessed at least one degree. Among the 73 baccalaureate degrees shown in Table 6, 13 are in mathematics, 23 in business administration, 24 in business education, 3 in economics, and 10 in one of the sciences or engineering.

TABLE 6

KIND OF SCHOOL BY DEGREES HELD BY DATA PROCESSING TEACHERS

	No Degree	Terminal Degrees Held Baccalaureate	Master's	Doctor's
High School	-	24	17	2
Vocational-Technical	5	10	3	-
Two-year College	3	3	16	1
Total	8	37	36	3

Special data processing courses--short- or long-term--were reported taken by 78 or 93 percent of the 84 instructors. Eighty-seven different titles were reported among the 124 courses taken by the 78 teachers. Since the contents of the courses could not be determined and the names of courses do not always signify contents, any analysis of the 124 courses is impossible.

Work experience in data processing was reported by 31 or 37 percent of the 84 teachers. Only three high school teachers reported having performed data processing work on the job, and two of these reported part-time work for nine months in one case and 14 months in the other. Of the 18 vocational teachers responding, 14 or 78 percent reported a total of 149 years' experience, ranging from less than two years to 22 years. For the 14 (61 percent) of the two-year college teachers who reported on-the-job experience in data processing, the total number of years was 97; experience ranged from one year to sixteen years.

When questioned as to the need for formal training in data processing, the statements made to the open-ended question were revealing. Of the 43 high school teachers (3 of whom had some work experience) only 2 indicated no further need for training. The other 41 (95 percent) stressed the need for more information on computer theory, 8; mathematics and program applications, 2; hands on experience on equipment--both unit record and/or computer, 28; actual work experience, 16; training in Fortran and Cobol, 12; more training in theory and hands-on unit record, 14; more depth in applications, 5; and 2 simply indicated the need for more training without outlining what type of training is needed. It is obvious that many teachers who are teaching data processing courses on the high school level feel a basic need for some type of work experience or training involving hands on the equipment.

The vocational teachers indicated training needs somewhat different from the high school teachers. Three stipulated no further need of formal training (all three of these had six years' or more job experience in data processing). Among the special needs suggested were: engineering applications, 4; more computer programming, 6; experiences on equipment other than that now being used in teaching, 5; updating of training to use third-generation computers, 4; and work in systems, 1.

Two-year college teachers needs differed more from the high school teachers than the vocational teachers. Interest in more computer programming was expressed by 6; advanced systems work, 6; updating of training, 5; work experience, 5; and short-term courses by manufacturers, 4.

Expanding Data Processing Offerings

An increasing number of schools are in the process of planning separate data processing course offerings. Two groups can be cited: one, the 24 vocational-technical schools in various stages of planning, each of which will offer at least one course; second, 26 of the 52 high schools which are now teaching units in data processing as parts of other existing courses[1] are in the processing of planning expanded work in separate courses. In addition, three high schools now offering data processing courses without any unit record equipment are planning to install it between 1968 and 1970. Seven high schools, four vocational-technical schools, and two of the community colleges plan installations of computers within the next three school years. Still another 32 schools reported on the Preliminary Questionnaire that plans are afoot for courses within the next three years.

Figure 2 presents the geographic distribution of the 24 vocational schools which plan to offer data processing and of the 26 high schools which are now offering units within the other courses and plan to expand to a full course. It is noted that 14 of these 50 schools planning data processing courses (28 percent) are in the western half of the state and 36 (72 percent) are in the eastern half.

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[1] bookkeeping, 4; business machines, 2; clerical practice, 3; keypunching, 4; office practice, 33; mathematics, 3; typewriting, 2; and one experimental course.

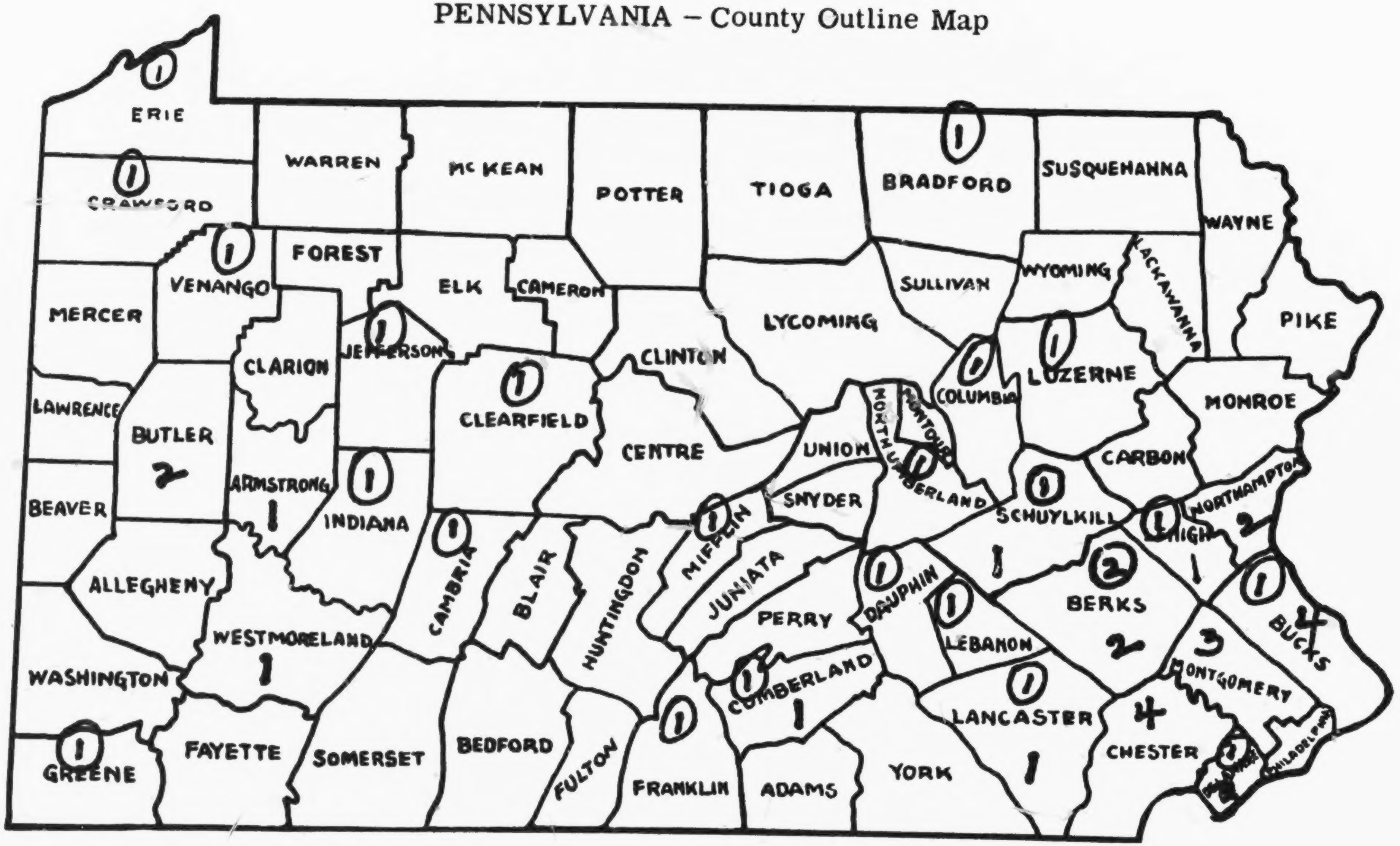
PENNSYLVANIA – County Outline Map
ERIE
CRAWFORD
WARREN
McKEAN
POTTER
TIOGA
BRADFORD
SUSQUEHANNA
WAYNE
PIKE
FOREST
VENANGO
MERCER
ELK
CAMERON
CLARION
JEFFERSON
LYCOMING
SULLIVAN
WYOMING
LACKAWANNA
LUZERNE
COLUMBIA
MONTOUR
NORTHUMBERLAND
CLINTON
CLEARFIELD
CENTRE
UNION
LAWRENCE
BUTLER
BEAVER
ARMSTRONG
INDIANA
MONROE
CARBON
SNYDER
SCHUYLKILL
NORTHAMPTON
LEHIGH
ALLEGHENY
CAMBRIA
BLAIR
HUNTINGDON
MIFFLIN
JUNIATA
PERRY
DAUPHIN
LEBANON
BERKS
BUCKS
MONTGOMERY
WESTMORELAND
WASHINGTON
CUMBERLAND
LANCASTER
CHESTER
DELAWARE
PHILADELPHIA
GREENE
FAYETTE
SOMERSET
BEDFORD
FULTON
FRANKLIN
ADAMS
YORK

FIGURE 2

PLANNED VOCATIONAL-TECHNICAL SCHOOLS AND HIGH SCHOOLS PLANNING SEPARATE DATA PROCESSING COURSES

Legend: ① signifies the vocational-technical schools in various stages of planning.
1 signifies an existing high school planning a separate course.

Conclusions stated here are generalizations of the data within this study. Page numbers are given for the reader who wishes to analyze the data in terms of the conclusion presented.

Conclusions

1. A significantly greater proportion of the vocational schools and two-year colleges in the State of Pennsylvania offer separate data processing courses than do the high schools. (Only 39 high schools out of 516 responding. See pp. 10-14.)

2. Data processing for vocational purposes is confined almost solely to the vocational-technical schools and the two-year colleges. (See pp. 20-27, II-31-40.)

3. When taught on the high school level, courses tend to emphasize the unit record concept (punched card) with limited time on equipment. (See p. 17, pp. 20-22, and pp. II-21-30.)

4. Courses taught on the high school level tend to ignore or de-emphasize the computer concepts and programming. (See pp. 21-22, II-16-20.)

5. There is little unanimity of objectives on any of the three educational levels as to coverage of unit record content. (See pp. 20-21, 22-23, 25-26.)

6. The two-year colleges and the vocational schools have unanimity of purpose in the coverage of computer operation and programming. (See pp. 23-25, 26-27.)

7. The differences in content between scientific and business data processing courses in the vocational schools are not clearly defined. (See p. 18, 27, II-5-7, II-21-30.)

8. High schools, in particular, need to re-evaluate their objectives in terms of the equipment available or procurable, as well as in relation

to their access to vocational schools. (See p. 34.)

9. Data processing teachers who have had multiple years of work experience in the field feel less need of further training than do those emerging directly from data processing training courses. (See pp. 36-37.)

10. With the increasing vocational schools and expanded offerings on the high school level, there is a definite need for concerted effort in training future teachers of data processing, as well as in assisting those now in the field in upgrading their knowledges and skills. (See pp. 37-39.)

Recommendations

Recommendations are based upon the conclusions and are hereby related to specific conclusions.

1. Conclusions 1 through 6 should be studied after data from the Bangs' study[1] becomes available. Findings of this study of national scope should provide answers to the conflicting objectives and equipment acquisitions reported by the high schools and vocational schools. What objectives should each of these two schools strive to achieve? Should there be duplication? These and other answers should be found after the Bangs' findings are analyzed.[2]

2. More evidence from follow-up studies and pupil placement from the vocational-technical and high schools is essential to determine the success of each in meeting its goals. (Conclusions 2 and 3.)

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[1] F. Kendrick Bangs, "Curricular Implications of Automated Data Processing for Educational Institutions." Study in process funded by the U.S. Office of Education.

[2] When the Bangs' report becomes available (probably in the fall of 1968) the researcher of this report will evaluate all data here in terms of Bangs' findings and make the analysis available to the schools of Pennsylvania.

3. The terms "scientific" and/or "business" data processing should be eliminated and the term "electronic data processing" substituted. The dichotomy which the present titles suggest cannot be substantiated by the data found in this study. For instance, the suggested curriculum under study for scientific programs[1] contains no provision for the teaching of unit record concepts and equipment; yet, multiple schools responding in this study included those phases as part of a course entitled scientific data processing. (Conclusion 7.)

4. Each school which offers a data processing course and does not now have a detailed course of study prepared for it should seek to develop one. Certain pertinent factors need to be considered. For instance, it is clear from analyzing many of the responses submitted for this study that the schools do not have clear-cut objectives for selecting the content taught. There is reason to suspect that schools may be adding a data processing course, particularly for high school business students, as a prestige item. Consideration should be given by each school offering work in this field as to the cognitive learnings which are vital to the course. Objectives stated in terms of terminal behavior sought at the end of the course might be helpful to those preparing the courses of study and determining levels of objectives. Were behavioral objectives stated, perhaps they would assist in the re-evaluation of information reported by the schools involved in this study. Perhaps two significant questions for the data processing teacher to ask himself are: "Does each student know what objectives he should meet by the termination of this course?" "At any point during the course does the student know how far he has progressed toward those objectives?" (Conclusions 5 and 8.)

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[1] "Scientific Data Processing Technology" copy.

5. The teacher certification question needs to be resolved. At the moment one type of certification exists for data processing teachers of the vocational-technical schools and none exists for the high school teacher, although one is being proposed. Is each a vocational data processing teacher? If so, does each need some work experience? Or, should there be a difference in the preparations and work experience of teachers in these two schools? Do the administrators of the schools and of the State Department wish to encourage two groups of certified data processing teachers, each with different qualifications? If so, what behaviors and cognitive learnings should each of the two groups possess? These are basic considerations which need thoughtful study and evaluation before the policies are firmly established. (Conclusion 9.)

6. In order to meet the basic needs of the teachers reporting in this study, two types of in-service programs should be established by the colleges. One would provide basic unit record concepts and hands-on experiences on related equipment, as well as some general familiarity with concepts of electronic computers and programming languages. Behavioral objectives for the course should be established and used in evaluating the progress of the students as they move through the course. Second, those who have the aptitudes should be provided with behavioral objectives for computer operation and programming of applications--both business and scientific--and should also be evaluated in terms of their progress toward those objectives established. (Conclusions 3 to 6 and 10.)

7. Concentrated effort should be expended to achieve greater articulation between the vocational-technical schools and industries to overcome the resistance of industry in hiring for electronic data

processing occupations those without some college background, despite their adequacy of preparation. (Conclusion 6 and interview data.)

Need for Further Study

Evidence is needed as to the educational level at which students should receive vocational preparation for each of the occupational categories in data processing. The Bangs' study referred to on page 41 should shed important light on this question. Further study may be needed within the Commonwealth if the answers are not found in the results of the Bangs' study.

A study should be made of the differences in qualifications of students, objectives, content, and outcomes of the data processing offered in the thirteenth and fourteenth years and in the community colleges. Should it be found that the backgrounds, abilities, and aptitudes of the students are similar and the content is similar, perhaps some means of gaining recognition for the vocational-school trained graduate might be found. Experiences of the vocational schools with programs on this level is that industrial concerns tend to think in terms of college background, even though there is a possibility that the backgrounds may be similar. Should the programs be found to be striving with different student populations, then a re-evaluation of the programs at each level would be in order to determine opportunities of placement within industry and a redirection of each program so that the conflict of interests no longer exists.

Progress at Eastern Montgomery County Vocational-Technical School

Visits to some of the high schools and vocational schools revealed that several have not yet put their objectives and other aspects of the course of study into writing. One vocational-technical school included in the study has made significant progress toward planning a data processing curriculum. For the purposes of guiding those schools who may be seeking a format, an example of one of their courses of study is presented in Appendix II, Exhibit 1. In addition to the basic scientific data processing outline presented, the Eastern Montgomery County Vocational-Technical School has two similar outlines which are omitted here because of space limitations.

This particular vocational school has planned its data processing offerings to provide complete flexibility to its students. For instance, a student who progresses to a given point and encounters difficulties of a substantial nature may drop back and concentrate on becoming more expert at those phases of the curriculum in which he performed well. Thus, after the two-year curriculum, pupils reach varying degrees of proficiency. The student who can absorb the theory and perform at the high levels is given learning experiences which permit him to develop to his fullest capacity; whereas, the student who evidences ability for the more routine aspects of the data processing cycle is given the opportunity to develop a level of proficiency which will permit him to enter and to succeed on the job.

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Rackley, J. R., "General Policy Statement on Electronic Computers and The Guidelines for the Use of Electronic Computers in Vocational Education," Commonwealth of Pennsylvania, Department of Public Instruction, Harrisburg, Pennsylvania: August 15, 1966.

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APPENDIX I

EXHIBIT 1

DATA PROCESSING INSTITUTES

1966 and 1967

Proposed Outline

Division I. Evolution of Data Processing
- A. Highlights of data processing development
- B. Manual methods through key driven machines
- C. Brief overview of punched card systems
- D. The need for electronic data processing systems

Division II. The Business Organization and Data Processing
- A. Function of business
- B. The organization chart
  - 1. The company
  - 2. The data processing unit
- C. Forms - flow chart
- D. Procedures - flow

Division III. The Unit Record
- A. Card format
- B. Card code
- C. Control punches
- D. Card field
- E. Flexibility in processing

Division IV. Machine Functions
- A. Recording
- B. Classifying
- C. Calculating
- D. Report preparation

Division V. Elements of a Machine
- A. Card feeding
- B. Card reading
- C. Printing units
- D. The control panel

Division VI. The Card Punch and Verifier
- A. Functions
- B. Features
- C. Alphabetic and numeric punching
- D. Duplicating
- E. The control card
- F. Verification

Division VII. Sorter
- A. Features
- B. Operating procedures
- C. Numeric and alphabetic sorting
- D. Block sorting

Division VIII. Interpreter
- A. Functions
- B. Features
- C. The column split
- D. Interpreting
- E. The selector
- F. Interpreting with selection

Division IX. Reproducing Punch
- A. Features
- B. Functions
- C. Operating procedures
- D. Reproducing
- E. Gangpunching
- F. Verifying

Division X. Collator
- A. Features
- B. Functions
- C. Operating procedures
- D. Sequence checking
- E. Selection
- F. Merging

Division XI. The Number Systems
- A. Base 10 numbering system
- B. Rational and irrational numbers
- C. Powers and roots
- D. Logarithms

Division XII. Representation of a Number with an Arbitrary Base
- A. Binary
- B. Octal
- C. Conversion from one base to another

Division XIII. Development of a Data Processing System
- A. Components of systems
    - 1. Stored programs
    - 2. Elements of problem solving
    - 3. Central processing unit
    - 4. Primary storage
    - 5. Arithmetic unit
    - 6. Logic ability
    - 7. Documentation
- B. Types of systems
    - 1. Manual
    - 2. Mechanical
    - 3. Electrical

Division XIV. Input-Output Media
- A. Card reader
- B. Card punch
- C. Magnetic tape unit

Division XV. Fixed and Floating Point Numbers
- A. Fixed point
    - 1. Sealing
    - 2. Advantages
- B. Floating Point
    - 1. Mantissa
    - 2. Exponent
    - 3. Advantages

Division XVI. Tabulators--Accounting Machines
- A. Functions
- B. Features
- C. Control Panel
    - 1. Detail printing
    - 2. Program control
    - 3. Addition and subtraction
    - 4. Group printing and group indication
    - 5. Selective printing
    - 6. Summary punching

Division XVII. Input-Output Media
- A. Paper tape reader
- B. Paper tape punch
- C. Magnetic character sensing
- D. Optical reader
- E. Printers
- F. Random access devices

Division XVIII. Internal Processing
- A. Loading the stored program
- B. Accessing
- C. Registers
- D. Data flow

Division XIX. Computer Characteristics
- A. Analog and digital
- B. Serial and parallel
- C. Buffered and unbuffered
- D. Sequential and non-sequential
- E. Numeric and alphanumeric
- F. Variable and fixed

Division XX. Computer Applications
- A. Effect of computer size
    - 1. Large scale
    - 2. Medium scale
    - 3. Small scale

- B. Specific application requirements
    - 1. Commercial
    - 2. Scientific
    - 3. Mixed
- C. An integrated data processing system

Division XXI. Organization of the Data Processing System
- A. Components
    - 1. Functions
    - 2. Features
    - 3. Speed
- B. Instruction format
- C. Storage organization
    - 1. Coding systems
    - 2. Addressing scheme
- D. Instruction and data flow
    - 1. Registers
    - 2. Instruction phase
    - 3. Execution phase

Division XXII. Man-Machine Communication
- A. Console control
    - 1. Man to machine
    - 2. Machine to man
- B. Sense switch control
- C. Inquiry stations
- D. Machine to man printouts
    - 1. Messages
    - 2. Memory printouts

Divison XXIII. Instructions - Card System
- A. Format control codes
- B. Card System input-output instructions
- C. Data movement instructions
- D. Arithmetic
- E. Branching
- F. Logic instructions
- G. Miscellaneous codes

Divison XXIV. Methods of Program Debugging
- A. Debugging a program before run time
- B. Debugging a program at run time
- C. Programming for ease of checkout

Division XXV. Housekeeping Techniques

Division XXVI. Loops and indexing
- A. Steps in programming a loop
- B. Index registers
- C. Various types of loops

Division XXVII. Calculators
- A. Functions
- B. Features
- C. Control Panel
    - 1. Add
    - 2. Subtract
    - 3. Multiply
    - 4. Divide

Division XXVIII. Subroutines
- A. The use of subroutines
- B. Subroutines and calling sequence
- C. The software as a computer

EXHIBIT 2

PRELIMINARY QUESTIONNAIRE
1967 DATA PROCESSING STUDY

Temple University
College of Education
Division of Vocational Education

The purpose of this questionnaire is to ascertain which schools provide course offerings in data processing, student access to equipment, and/or computer assisted instruction, as well as to determine plans for future offerings.

****

____
Name of School
(Please Print)

____
Address of School

____
City State Zip Code

____
Name and Title of Person Completing the Questionnaire
(Please Print)

________________________________ ______________
Signature of Person Completing Questionnaire Date

****

CODE

1 - 2 Card Code
3 - 5 Questionnaire Number
6 - 8 School Number

9. School Classification (Please check one)

__________1 Jr.-Sr. High School
__________2 Sr. High School
__________3 Vocational-Technical School
__________4 Publicly-supported Community College
__________5 Other (please specify)

PLEASE RETURN TO:
Dr. Adele F. Schrag, Project Director
Temple University, Division of Vocational Education
Room 57, Seltzer Building
Philadelphia, Pennsylvania 19122

10. Is data processing taught in your school either as a separate course or as part of an existing course?

__________1 Yes

__________5 No

11. Is computer-assisted instruction available to your students?

__________1 Yes

__________5 No

12. Does your school system have access to unit record equipment (sorter, collator, tabulator, etc.)?

__________1 Yes

__________5 No

13. If unit record equipment is available, where is it housed?

__________1 On premises
__________2 At local vocational-technical school
__________3 At local community college
__________4 Other (please specify)

14. Is the unit record equipment available to students for hands-on experience?

__________1 Yes

__________5 No
(if "no," please skip to Question 16)

15. If unit record equipment is used by students, when was the first school year during which they had access to it?

__________1 1960-1961
__________2 1961-1962
__________3 1962-1963
__________4 1963-1964
__________5 1964-1965
__________6 1965-1966
__________7 1966-1967
__________8 1967-1968

Questions 16 and 17 to be answered only by respondents who do not now make unit record equipment available to students:

16. Do you plan to make the unit record equipment available to the students?

__________1 Yes

__________5 No

17. When do you plan on having students use the unit record components?

__________1 1967-1968
__________2 1968-1969
__________3 1969-1970
__________4 1970-1971

ELECTRONIC COMPUTERS

18. Does your school system have access to an electronic computer?

________1 Yes

________5 No

19. If a computer is available, where is it housed?

________1 On premises
________2 At local vocational-technical school
________3 At local community college
________4 Other (please specify)

20. Is the computer available to students?

________1 Yes

________5 No

(If "no," please skip to Question 22)

21. If your students have access to an electronic computer, when was the first school year it was made available for student use?

________1 1960-1961
________2 1961-1962
________3 1962-1963
________4 1963-1964
________5 1964-1965
________6 1965-1966
________7 1966-1967
________8 1967-1968

Questions 22 and 23 to be answered only by respondents who do not now make computers available to students:

22. If an electronic computer is not currently used by students, do you plan on making it available?

________1 Yes

________5 No

23. What is your target for student use of the computer?

________1 1967-1968
________2 1968-1969
________3 1969-1970
________4 1970-1971

24. Please list the names and responsibilities of your teachers and staff who are working with unit record equipment, computers, or computer-assisted instruction.

1. ____
Name Department

____
Responsible for

2. ____
Name Department

____
Responsible for

3. ____
Name Department

____
Responsible for

4. ____
Name Department

____
Responsible for

5. ____
Name Department

____
Responsible for

APPENDIX I

EXHIBIT 3

TEMPLE UNIVERSITY
COLLEGE OF EDUCATION
PHILADELPHIA, PENNSYLVANIA 19122

DIVISION OF
VOCATIONAL EDUCATION

BUSINESS EDUCATION

November 6, 1967

As a teacher of data processing, you are in a position to provide data regarding your school's offerings in this rapidly growing field.

This questionnaire is part of a study I am conducting to determine the status of data processing instruction in schools of the Commonwealth. The study is being financed through the Pennsylvania Division of Vocational, Technical, and Continuing Education.

A preliminary questionnaire elicited responses from school administrators. Through that instrument we were able to pinpoint schools now teaching data processing courses--with or without equipment.

This questionnaire is designed to provide information as to content being covered in the course(s) and equipment available for hands-on experience by the students. Should there be several teaching such courses in your school, you will want to collaborate in identifying the content presented in all courses. For this reason, I am enclosing two questionnaires--one of which you may keep in your file. The completed questionnaire will present an over-all picture of data processing taught in your school. You will, of course, receive a copy of the results of this study when it is completed.

By returning one copy of this questionnaire by Wednesday, November 22, 1967, you will assist us in meeting our deadline with the Commonwealth.

Sincerely yours,

Adele F. Schrag
Project Director

AFS:sml

Enclosures (2)

QUESTIONNAIRE ON EQUIPMENT AND COURSE CONTENT

1967 DATA PROCESSING STUDY

Temple University
College of Education
Division of Vocational Education

* *

Your school was one which responded to the preliminary questionnaire as offering a course in data processing. The purpose of this questionnaire is to procure information regarding the equipment used for data processing instruction and the content included in the course(s) offered.

THE INFORMATION BELOW SHOULD APPLY TO COURSES OFFERED ONLY WITHIN YOUR SCHOOL. (Should your students take data processing courses at your area vocational-technical school, simply write a statement of that fact across the face of this questionnaire, including the name of the area school.)

* *

I. COURSES AVAILABLE. Please indicate information concerning each course by checking the appropriate columns.

Code
-10-58

Title of Course	Place in Curriculum		Grade Level	Duration (Years)	Average Number of Hours Per Week Per Student		
	Required	Elective			In Class	On Unit Record	On Computer
1.							
2.							
3.							
4.							
5.							
6.							

PLEASE RETURN QUESTIONNAIRE BY NOVEMBER 22 TO:
Dr. Adele F. Schrag, Project Director
Temple University, Division of Vocational Education
Room 316, Seltzer Building
Philadelphia, Pennsylvania 19122

II. COURSE CONTENT. Please indicate the content you are now including in the separate data processing course(s) and the emphasis you are giving each item of content. Place appropriate checks beside each item.

Code	Item	Covered in Content			Not Covered
		Objective Vocational Competency	For Background Information Only	Covered In Text---Not In Class	
	The Business Organization				
2-10	Function of business				
11	Classifications of business				
12	Systems concept				
13	Organizational structure				
14	Forms: flow chart				
15	Procedures: flow				
	Unit-Record				
16	Card format				
17	Card code				
18	Control punches				
19	Card field				
	Machine Functions				
20	Recording				
21	Classifying				
22	Calculating				
23	Interpreting				
24	Report preparation				
25	Storing				
	The Card Punch and Verifier				
26	Functions				
27	Features				
28	Alphabetic and numeric punching				
29	Duplicating				
30	The control card				
31	Verification				
	Sorter				
32	Functions				
33	Features				
34	Operating procedures				
35	Numerical and alphabetic sorting				
36	Block sorting				

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Code	Item	Covered in Content			Not Covered
		Objective Vocational Competency	For Background Information Only	Covered In Text---Not In Class	
	Interpreter				
37	Functions				
38	Features				
39	The column split				
40	Interpreting				
41	The selector				
42	Interpreting with selection				
	Reproducing Punch				
43	Functions				
44	Features				
45	Operating procedures				
46	Reproducing				
47	Gang punching				
48	Verifying				
	Collator				
49	Functions				
50	Features				
51	Operating procedures				
52	Sequence checking				
53	Selection				
54	Merging				
	Tabulators--Accounting Machines				
55	Functions				
56	Features				
	Control Panel				
57	Detail printing				
58	Program control				
59	Addition and substraction				
60	Group printing and indication				
61	Selective printing				
62	Summary punching				
	Calculators				
63	Functions				
64	Features				
	Control Panel				

Code	Item	Covered in Content			Not Covered
		Objective Vocational Competency	For Background Information Only	Covered In Text---Not In Class	
65	Add				
66	Subtract				
67	Multiply				
	Electronic Data Processing				
	Components of System				
3-10	Stored programs				
11	Elements of problem-solving				
12	Central processing unit				
13	Primary storage				
14	Arithmetic unit				
15	Logic ability				
16	Documentation				
	Types of Systems				
17	Manual				
18	Mechanical				
19	Electrical				
	Input-Output Media				
20	Card reader				
21	Card punch				
22	Magnetic tape unit				
23	Paper tape reader				
24	Paper tape punch				
25	Magnetic character sensing				
26	Optical reader				
27	Printers				
28	Random access devices				
	Internal Processing				
29	Loading the stored program				
30	Accessing				
31	Registers				
32	Data flow				
	Computer Characteristics				
33	Analog and digital				
34	Serial and parallel				
35	Buffered and unbuffered				
36	Sequential and nonsequential				

Code	Item	Covered in Content			Not Covered
		Objective Vocational Competency	For Background Information Only	Covered In Text---Not In Class	
37	Numeric and alphanumeric				
38	Variable and fixed				
	Organization of the Data Processing				
39	Compenents				
40	Functions				
41	Features				
42	Speed				
43	Instruction format				
44	Storage organization				
45	Coding systems				
46	Addressing scheme				
47	Instruction and data flow				
48	Registers				
49	Instruction phase				
50	Execution phase				
	Man-Machine Communications				
51	Console control				
52	Man to machine				
53	Machine to man				
54	Sense switch control				
55	Inquiry stations				
56	Machine to man printouts				
57	Messages				
58	Memory printouts				
	Instructions: Card System				
59	Format control codes				
60	Card system input-output instructions				
61	Data movement instructions				
62	Arithmetic				
63	Branching				
64	Logic instructions				
65	Miscellaneous codes				
	Methods of Program Debugging				
66	Debugging a program before run time				
67	Debugging a program at run time				

Code	Item	Covered in Content			
		Objective Vocational Competency	For Background Information Only	Covered In Text---Not In Class	Not Covered
68	Programing for ease of checkout				
69	Housekeeping Techniques				
70	Loops and Indexing				
71	Steps in programing a loop				
72	Index registers				
73	Various types of loops				
74	Subroutines				
75	The use of subroutines				
76	Subroutines and calling sequence				
77	The software as a computer				
	Programing a Tape System				
4-10	Magnetic tape characteristics				
11	Magnetic tape file organization				
12	Instructions				
13	End-of-reel, file, job routines				
14	Timing individual tape operations				
15	The medium-scale tape system in support of a large-scale data processing system				
	Programing a Random Access Device				
16	Random access characteristics				
17	Random access file organization				
18	Instructions				
19	File loading routines				
20	File dumping procedures				
21	Timing random access operations				
22	Inquiry station				
	Program Testing				
23	Program listings				
24	Test data				
25	Operating instructions				
26	Checklists				
27	Precalculated answers				
28	Desk checking				
29	Debugging techniques				

Code	Item	Covered in Content			Not Covered
		Objective Vocational Competency	For Background Information Only	Covered In Text---Not In Class	
	Programing Systems				
30	The language				
31	The processor				
32	Advantages--disadvantages				
33	Assembly Programs and Compilers				
34	Macro Generators				
35	Report Generators				
	Data Scheduling Systems--Tape				
36	Scheduling function				
37	Blocking-deblocking function				
38	Error correction function				
39	End of operation functions				
40	Tape labeling functions				
41	Checkpoint and restart functions				
42	Disc file area				
43	Sort-Merge				
44	Internal sort				
45	Merge				
46	Monitors				
47	Concept				
48	Application areas				
	Languages				
49	COBOL				
50	Fortran II				
51	Fortran IV				
52	Autocoder				
53	SPS				
54	PL-1				
55	Neat				
56	Other______________ (Please specify)				
57	Other______________ (Please specify)				
58	Other______________ (Please specify)				

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·III. EQUIPMENT AVAILABLE FOR STUDENT USE--VOCATIONAL INSTRUCTION

A. Unit Record

Code		Manufacturer and Model Numbers	Number Available	Average Number of Hours Per Week Each Student Uses Equipment
5-10-12	Key punch			
13-15	Verifier			
16-18	Sorter			
19-21	Collator			
22-24	Interpreter			
25-27	Reproducer			
28-30	Tabulator or Acctg. Machine			
31-33	Other (Specify)			
34-36	Other (Specify)			

B. Computers. Please encircle model number of computer(s) under appropriate manufacturer and use columns for giving specific information.

Code	Manufacturer and Model Numbers	Where Housed?	Average Number of Hours Per Week Each Student Uses Equipment
37-48	Burroughs 300; 2500; 3500; 5500; 6503; 6504; 6506; 7504; 7506; 8500		
49-57	Control Data 3100; 3300; 3500; 6400; 6500; 6600		
58-66	General Electric 115; 215; 225; 235; 415; 425; 435; 625; 635		
67-75	Honeywell 120; 200; 400; 800; 1200; 1400; 1800; 2200; 4200; 8200		
6-10-21	IBM 360-20; 360-30; 360-40; 360-44; 360-50; 360-65; 360-67; 360-75; 1130; 1401; 1410; 1440; 1460; 7010; 7040; 7044; 7070; 7074; 7080; 7090; 7094; 7094II		
22-33	National Cash Register 315 RMC; 315-100; 390; 500		
34-42	Philco-Ford 102M; 211; 212; 214		

Code	Manufacturer and Model Numbers	Where Housed?	Average Number of Hours Per Week Each Student Uses Equipment
43-51	Radio Corporation of America Spectra 70/15; 70/25; 70/35; 70/45; 70/46; 70/55		
52-66	Univac Division Univac III; 418; 491; 492; 494; 1004; 1005; 1050; 1108 II; 9200; 9300		

C. Special Input Devices. (i.e., optical scanner, magnetic scanner, paper tape.)

Code	Manufacturer and Model Numbers	Number Available
67-75		

IV. TEACHING PERSONNEL. Please list names and data processing courses assigned to each member of teaching staff during current academic year.

	Names of Instructors	Data Processing Courses Now Taught
1.		
2.		
3.		
4.		
5.		
6.		

* *

Name of School (Please Print)

Address of School

City State County Zip Code

Name and Title of Person Completing the Questionnaire (Please Print)

Signature of Person Completing Questionnaire Date

* *

APPENDIX I

EXHIBIT 5

TEMPLE UNIVERSITY
COLLEGE OF EDUCATION
PHILADELPHIA, PENNSYLVANIA 19122

DIVISION OF
VOCATIONAL EDUCATION

BUSINESS EDUCATION

April 2, 1968

Dear Administrator:

We are now in Phase III of our Data Processing Study for the Commonwealth of Pennsylvania, Department of Public Instruction, Division of Vocational, Technical, and Continuing Education.

Your school was one which reported a separate data processing course, and we have received specific information from your data processing instructor(s). As a part of good research procedure, we are now asking you to complete this simple form in order that we may validate the information which we have received in detail.

By completing the questionnaire and returning it to me in the enclosed addressed and stamped envelope, you will be contributing significantly to the study. Also, you will receive a copy of the completed study during July, 1968.

Sincerely yours,

Adele F. Schrag
Project Director

AFS:cem

-------------------------PLEASE SEND BY RETURN MAIL-------------------------

1. How many separate data processing courses are offered on the premises of your school? (Please check)

   ____1 ____2 ____3 ____4 ____5 ____6 ____7 ____8 or More

2. Do your students have the opportunity to operate a sorter?

   ____Yes ____No

3. Do your students have the opportunity to operate an accounting machine (sometimes referred to as a tabulator)?

   ____Yes ____No

4. Do your students have the opportunity to write a program for the computer and actually run that program themselves?

   ____Yes ____No

Data Processing Study

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5. How many programs would you estimate your computer students have written during the course of their training in data processing?

____None ____1-5 ____6-10 ____11 or more

6. Is your unit record work taught for

____Vocational competency or ____Acquaintanceship

7. How many instructors are involved in teaching unit record data processing in your school?

____None ____1-3 ____4-6 ____7-9 ____10 or more

8. How many instructors are involved in teaching electronic data processing in your school?

____None ____1-3 ____4-6 ____7-9 ____10 or more

9. Do you offer a course in which business applications are prepared for the computer?

____Yes ____No

10. Do you offer a course in which scientific applications are prepared for the computer?

____Yes ____No

____
NAME OF ADMINISTRATOR RESPONDING

____
NAME OF SCHOOL

____
ADDRESS OF SCHOOL

____
COUNTY

Return in enclosed envelope to: Dr. Adele F. Schrag
Temple University
Philadelphia, Pennsylvania

APPENDIX I

EXHIBIT 6

TEMPLE UNIVERSITY
COLLEGE OF EDUCATION
PHILADELPHIA, PENNSYLVANIA 19122

DIVISION OF
VOCATIONAL EDUCATION

BUSINESS EDUCATION

March 28, 1968

Dear Teacher of Data Processing:

Because your school offers a separate course in data processing, it is being included in a state-wide study for the Commonwealth of Pennsylvania, Division of Vocational, Technical, and Continuing Education.

It is essential that we include as part of this study data regarding the qualifications of the individual teachers of data processing. With such information we will be able to make recommendations to the Commonwealth regarding the need for the establishment of additional in-service courses in data processing.

The enclosed questionnaire is simple to complete and will take just a few minutes. By completing it promptly you will be contributing significantly to the study under way. Your principal will receive a copy of the findings of the study during the summer of 1968 and will make it available to you.

May I have the questionnaire returned in the enclosed, addressed and stamped envelope by Wednesday, April 3.

Sincerely yours,

Adele F. Schrag
Project Director

AFS:em

Enclosures: Questionnaire
Reply Envelope

APPENDIX I

EXHIBIT 7

QUESTIONNAIRE FOR TEACHERS OF DATA PROCESSING

Commonwealth of Pennsylvania

1967-1968

I. Personal Data

Name ______________________ Home Address ______________________

City, County ______________________

School ______________________ State ______________________

School Address ______________________
Street City County

Education:

	Institution	Major	Year
B.S. Degree			
Master's Degree			
Above Master's (degree or credits)			

Special Data Processing Courses or Institutes

					Approximate Hours Spent on	
	Course Title	Institution or Agency	Dates From-To	Theory	Hands on Unit Record	Computer
1.						
2.						
3.						
4.						
5.						

II. Data Processing Work Experience (List most recent first)

	From-To	Name of Company	Location	Name of Supervisor	Description of Duties	Equipment Used
1.						
2.						
3.						

III. Titles of Data Processing Courses You Are Now Teaching

1. ______________________ 2. ______________________

3. ______________________ 4. ______________________

IV. Your Opinion

A. Do you feel a need for more formal training in data processing?

_____Yes _____No

B. If "yes" above, describe the kind of course, workshop, seminar, or institute you believe would be helpful to you in improving and upgrading your knowledge in the field. (Please be explicit.)

____

____

____

____

____

____

C. What other recommendations would you make regarding the initial preparation of teachers of data processing and/or the upgrading of present teachers.

____

____

____

______________________ ______________________

Date Signature

Please return questionnaire by April 3, 1968 to: (Use enclosed addressed and stamped envelope.)

Dr. Adele F. Schrag
Temple University
Department of Business Education
Philadelphia, Pennsylvania 19122

APPENDIX II

TABLE 1

KIND OF SCHOOL BY COURSE BY GRADE LEVEL BY YEARS BY HOURS IN CLASS AND ON EQUIPMENT, 1967-1968

Title of Course	School No.	Grade Level	Duration in Years	Average Hours per Week per Student		
				In Class	On Unit Record	On Computer
Junior-Senior High Schools (8)						
Data Processing	1	11 or 12	1	5	5	-
Data Processing	2	12	1	4 1/2 combined		-
Orientation to Data Processing	3	12	1/2	5	2 1/2	-
Data Processing	4	12	1	4	1	-
Data Processing	5	12	1	2 1/2 combined		-
Automated Office Machines	6	12	1	5	5	-
Data Processing I	7	11 or 12	1	-	3 3/4	-
Data Processing II		12	1	-	3 3/4	-
Data Processing Operator		11	1/2	-	1 1/4	-
Basic Data Processing	8	11 or 12	1	2	-	-

Appendix II - Table 1 continued

Title of Course	School No.	Grade Level	Duration in Years	Average Hours per Week per Student		
				In Class	On Unit Record	On Computer
Senior High Schools (31)						
Data Processing	9	12	1	2	2	-
Unit Record	10	12	1	5	-	-
Data Input		12	1	-	5	-
Data Processing	11	12	1	4 1/2	-	-
Data Processing		12	1/2	4 1/2	-	-
Data Processing	12	10, 11 or 12	1	3	6 during course	-
Computer Programming		11 or 12	1	4	-	1
Theory of Data Processing	13	12	1/2	4	-	-
Introduction to Data Processing	14	10, 11 or 12	1/2	4	-	-
Unit Record	15	12	1/2	1	1	-
Data Processing	16	12	1/2	4	1/2	1/2
Computer Programming		11 or 12	1/2	4	-	1/2
Computer Programming	17	10 to 12	3	5	2	3
Wiring Principles		12	1	3	7	-
Data Processing	18	12	1	7 1/2 combined		-
Data Processing	19	12	1	3	4 1/2	-

Appendix II - Table 1 continued

Title of Course	School No.	Grade Level	Duration in Years	Average Hours per Week per Student In Class	On Unit Record	On Computer
Senior High Schools (continued)						
Computer Programming	20	10, 11 or 12	1	2	-	1/4
Data Processing	21	12	1	4	-	-
Data Processing	22	11 or 12	1	3 1/2	1/2	-
Fortran		11 or 12	1	2	-	-
Computer Programming	23	12	1	3	-	-
Introduction to Data Processing	24	11 or 12	1/2	5	-	-
Data Processing	25	12	1	1/2	-	-
Data Processing - Applied Accounting	26	12	1	1	3 3/4	1/4
Data Processing - Punched Card Equipment		11 or 12	1	1	3 3/4	1/4
Basic Computer Concepts and Applications		11 or 12	1	3	-	2
Data Processing	27	12	1	3 3/4	3/4	1/4
Data Processing I	28	11	1	5	5	-
Data Processing II		12	1	5	2	3
Principles of Automation	29	12	1/2	5	-	-
Introduction to Data Processing	30	12	1	3	1	-

Appendix II - Table 1 continued

Title of Course	School No.	Grade Level	Duration in Years	Average Hours per Week per Student In Class	On Unit Record	On Computer
Senior High Schools (continued)						
Engineering Concepts	31	12	1	4	-	1/2
Business Data Processing	32	12	1	5	10 hours total	
Business Machine Data Processing	33	12	1	30 hours total		
Data Processing I	34	11 or 12	1	3	2	-
Computer Mathematics	35	11 or 12	1	2	-	1/4
Data Processing	36	11 or 12	1/2	5	-	-
Computer Programming	37	11 or 12	1	1 1/2	-	-
Data Processing Survey	38	12	1/2	5	-	-
Computer Theory		11 or 12	1	3	-	2
Computer Concepts	39	11 or 12	1	2	1 1/2	1/2
Computer Concepts		11 or 12	1	5	3 1/2	1 1/2

Appendix II - Table 1 continued

Title of Course	School No.	Grade Level	Duration in Years	Average Hours per Week per Student In Class	On Unit Record	On Computer
Vocational-Technical Schools (19)						
Data Processing I	40	11	1	10	5	-
Data Processing II		12	1	10	3	2
Computer Data Processing Technology - Scientific	41	13 & 14	2	6	3	3
Computer Data Processing Technology - Business		13 & 14	2	6	3	3
Data Processing	42	13	1	5	10	-
Scientific Data Processing	43	11 & 12	2	3/4	(Grade 11) 1/2	(Grade 12) 1/2
Data Processing	44	12	1	5	4	6
Data Processing I	45	11	1	5	4 1/2	-
Data Processing II		12	1	6	3	1/2
Data Processing I	46	12	1	-	3 3/4	-
Data Processing I and II		11 & 12	2	-	3 3/4	-
Unit Record Equipment I		13	1	-	7 1/2	-
Computer Theory I		13	1	6	-	1 1/2
Data Processing and Computer Programming	47	11 & 12	2	5	(Grade 11) 10	(Grade 12) 10
Computer Mathematics	48	13 & 14	2	5	-	-
Computer Programming		13 & 14	2	-	15 combined	

Appendix II - Table 1 continued

Title of Course	School No.	Grade Level	Duration in Years	Average Hours per Week per Student In Class	On Unit Record	On Computer
Vocational-Technical Schools (continued)						
Scientific Data Processing	49	13 & 14	1 or 2	7 1/2	7 1/2	7 1/2
Business Data Processing		13 & 14	1	7 1/2	7 1/2	7 1/2
Data Processing	50	11 & 12	2	15	4	1/2
Introduction to Data Processing	51	11	1	5	5	-
Introduction to Computer Programming		12	1	5	-	5
Computer Mathematics		12	1	5	-	2
Fortran Programming		13	1	5	-	5
Data Processing I	52	11 or 12	1	15	-	1
Data Processing II		12	1	15	-	1
Computer Programming	53	10 to 12	3	5	-	5
Data Processing		12	1	5	5	-
Data Processing	54	10 to 12	3	16	6	5
Data Processing	55	12	1	15	15	-
Data Processing	56	10 to 12	3	10	-	-
Programming Cobol	57	11 & 12	2	10	-	5
Programming Fortran		12	1	2	-	1
Computer Programming		11	1	5	-	10

Appendix II - Table 1 continued

Title of Course	School No.	Grade Level	Duration in Years	Average Hours per Week per Student In Class	On Unit Record	On Computer
Vocational-Technical Schools (continued)						
Electric Accounting Machines	58	13	1	6	6	-
Programming 1620		13 & 14	1 1/2	6	-	6
System Study		14	1	6	-	-
Community Colleges (14)						
Introduction to Data Processing	59	1	1/2	3	2	-
Problem Definitions		1	1/2	3	-	-
Introduction to Computer Languages		1	1/2	3	-	2
Fortran or		2	1/2	3	-	2
Cobol		2	1/2	3	-	2
Seminar		2	1/2	3	-	-
Independent Study		2	1/2	3	-	-
Computer Mathematics and Logic		1 or 2	1/2	3	-	-
Data Processing I	60	1	1/2	3	3	-
Introduction to Computers		1	1/2	3	-	-
Computer Programming I		1	1/2	3	-	3
Systems and Procedures I and II		2	1	3	-	2
Computer Programming II		2	1/2	3	-	3
Operating Systems and Techniques		2	1/2	2	-	2
Scientific Computer I and II		2	1	3	-	-
Scientific Data Processing Project		2	1/2	1	-	3
Analog Computer I and II		2	1/2	2	-	2

Appendix II - Table 1 continued

Title of Course	School No.	Grade Level	Duration in Years	Average Hours per Week per Student		
				In Class	On Unit Record	On Computer
Community Colleges (continued)						
Introduction to Data Processing	61	1	1/2	3	-	-
Wiring of Unit Record Equipment		1	1/2	1	2	-
Basic Computer Operation		1 or 2	1/2	3	-	-
Systems and Processing I		1 or 2	1/2	3	-	-
Systems and Processing II		1 or 2	1/2	3	-	-
Fundamentals of Data Processing	62	1	1/2	4	3	-
Introduction to Programming		1	1/2	3	-	4
Data Processing Applications		1	1/2	3	-	-
Computer Programming I and II		2	1	3	-	3
Systems Development and Design		2	1/2	3	-	2
Field Project in Data Processing		2	1/2	1	-	4
Data Processing Supervisor		2	1/2	2	-	-
Advanced Programming Systems		2	1/2	2	-	3
Introduction to Data Processing	63	1	1/2	3	-	-
Electro-Mechanical Data Processing		1	1/2	4	-	-
Systems and Procedures		1	1/2	4	-	-
Computer Programming I and II		1 or 2	1	5	-	1
Computer Systems I and II		1 or 2	1	3	-	1/2
Cobol		2	1/2	4	-	1
Computer Science I	64	1	1/4	2 1/2	-	-
Computer Science II		1	1/4	2 1/2	-	-
Computer Science III		1	1/4	1 1/4	-	-

Appendix II - Table 1 continued

Title of Course	School No.	Grade Level	Duration in Years	Average Hours per Week per Student In Class	On Unit Record	On Computer
Community Colleges (continued)						
Basic Computer Programming	65	2	1/3	2 1/2	-	1/2
Introduction to Algorithmic Programming		1 or 2	1/3	3 3/4	-	1/2
Computer Organization		1 or 2	1/3	3 3/4	-	1/2
Computer Science 1	66	1 or 2	1/3	2 1/2	1 1/4	-
Computer Science 802		1 or 2	1/3	1 1/4	1 1/4	-
Computer Science 803		1 or 2	1/3	1 1/4	1 1/4	-
Introduction to Engineering	67	1	1/3	1	1/2	-
Basic Computer Programming		2	1/3	2	1	-
Systems Development and Design		2	1/3	1	2	-
Data Processing Applications		2	1/3	1	2	-
Data Processing I	68	1	1/4	2	3	-
Data Processing II		1	1/4	2	3	-
Data Mathematics I		1	1/4	3	-	-
Basic Computer		1	1/4	3	-	-
Systems and Procedures I and II		2	1/2	3	-	-
Computer Programming I and II		2	1/2	3	1	-
Data Mathematics II		2	1/4	3	-	3
Unit Record	69	1	1/2	3	4	-
Computer Concepts		1	1/2	3	-	4
Autocoder		1	1/2	3	-	4
10 CS Autocoder		2	1/2	3	-	4
Cobol		2	1/2	3	-	4
Fortran		2	1/2	3	-	4

Appendix II - Table 1 continued

Title of Course	School No.	Grade Level	Duration in Years	Average Hours per Week per Student In Class	On Unit Record	On Computer
Community Colleges (continued)						
Fundamentals of Data Processing	70	1	1/2	3	-	-
Unit Record Equipment		1	1/2	2	2	-
Systems Study and Design		2	1/2	3	-	-
Data Processing Applications		1	1/2	3	-	-
Programming I (Fortran)		1	1/2	2	-	2
Programming II (360 Assembler)		2	1/2	2	-	2
Programming III (Cobol)		2	1/2	2	-	2
Scientific Programming		2	1/2	2	-	2
Case Problems in Computer Science		2	1/2	2	-	2
Electronic Data Processing I	71	1	1/2	3	4	-
Electronic Data Processing II (Fortran)		1	1/2	3	-	4
Electronic Data Processing III (Assembler)		2	1/2	3	-	4
Electronic Data Processing IV (Cobol)		2	1/2	3	-	4
Systems Analysis and Design		2	1/2	3	-	-
Introduction to Data Processing	72	1 or 2	1/2	3	1/4	-
Electric Accounting Machines		1	1/2	2	4	-
Introductory Programming		1	1/2	3	-	3
Intermediate Programming		2	1/2	3	-	3
Advanced Programming		2	1/2	3	-	3
Systems Analysis and Design		2	1/2	3	-	-

APPENDIX II

TABLE 2

JUNIOR-SENIOR AND SENIOR HIGH SCHOOLS BY CONTENT COVERED AND DEGREE OF COVERAGE, 1967-1968

Content	Degree of Coverage									
	Vocational Competency No.	Vocational Competency Percent[1]	Background Information No.	Background Information Percent[1]	Covered in Text --Not in Class No.	Covered in Text --Not in Class Percent[1]	Not Covered No.	Not Covered Percent[1]	No Response No.	No Response Percent[1]
The Business Organization										
Function of business	6	15.4	20	51.3	1	2.6	8	20.5	4	10.3
Classifications of business	5	12.8	16	41.0	1	2.6	12	30.8	5	12.8
Systems concept	5	12.8	18	46.2	-	-	12	30.8	4	10.3
Organizational structure	5	12.8	17	43.6	-	-	12	30.8	5	12.8
Forms: flow chart	6	15.4	17	43.6	2	5.1	8	20.5	6	15.4
Procedures: flow	5	12.8	18	46.2	1	2.6	11	28.2	4	10.3
Unit-Record										
Card format	22	56.4	14	35.9	-	-	3	7.7	-	-
Card code	23	59.0	13	33.3	-	-	3	7.7	-	-
Control punches	22	56.4	14	35.9	-	-	3	7.7	-	-
Card field	23	59.0	12	30.8	-	-	4	10.3	-	-
Machine Functions										
Recording	18	46.2	16	41.0	-	-	3	7.7	2	5.1
Classifying	17	43.6	16	41.0	-	-	4	10.3	2	5.1
Calculating	14	35.9	18	46.2	1	2.6	3	7.7	3	7.7
Interpreting	14	35.9	19	48.7	-	-	3	7.7	3	7.7
Report preparation	17	43.6	14	35.9	-	-	4	10.3	4	10.3
Storing	12	30.8	16	41.0	2	5.1	7	17.9	2	5.1

Appendix II - Table 2 continued

Content	Degree of Coverage Vocational Competency		Degree of Coverage Background Information		Covered in Text --Not in Class		Not Covered		No Response	
	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]
The Card Punch and Verifier										
Functions	21	53.8	16	41.0	-	-	2	5.1	-	-
Features	21	53.8	14	35.9	2	5.1	2	5.1	-	-
Alphabetic and numeric punching	22	56.4	15	38.5	-	-	2	5.1	-	-
Duplicating	20	51.3	15	38.5	1	2.6	3	7.7	-	-
The control card	19	48.7	15	38.5	2	5.1	2	5.1	1	2.6
Verification	13	33.3	17	43.6	1	2.6	7	17.9	1	2.6
Sorter										
Functions	19	48.7	15	38.5	-	-	5	12.8	-	-
Features	19	48.7	15	38.5	-	-	5	12.8	-	-
Operating procedures	19	48.7	13	33.3	1	2.6	6	15.4	-	-
Numerical and alphabetic sorting	19	48.7	11	28.2	1	2.6	6	15.4	2	5.1
Block sorting	18	46.2	8	20.5	-	-	8	20.5	5	12.8
Interpreter										
Functions	7	17.9	20	51.3	-	-	9	23.1	3	7.7
Features	7	17.9	20	51.3	-	-	10	25.7	2	5.1
The column split	5	12.8	14	35.9	-	-	14	35.9	6	15.4
Interpreting	7	17.9	17	43.6	-	-	12	30.8	3	7.7
The selector	5	12.8	16	41.0	-	-	13	33.3	5	12.8
Interpreting with selection	5	12.8	15	38.5	-	-	13	33.3	6	15.4

Appendix II - Table 2 continued

Content	Degree of Coverage				Covered in Text --Not in Class		Not Covered		No Response	
	Vocational Competency		Background Information							
	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]
Reproducing Punch										
Functions	13	33.3	19	48.7	-	-	4	10.3	3	7.7
Features	13	33.3	20	51.3	-	-	3	7.7	3	7.7
Operating procedures	13	33.3	18	46.2	-	-	5	12.8	3	7.7
Reproducing	13	33.3	19	48.7	-	-	5	12.8	2	5.1
Gang punching	13	33.3	17	43.6	-	-	5	12.8	4	10.3
Collator										
Functions	8	20.5	22	56.4	-	-	5	12.8	4	10.3
Features	8	20.5	22	56.4	-	-	5	12.8	4	10.3
Operating procedures	8	20.5	21	53.8	-	-	7	17.9	3	7.7
Sequence checking	8	20.5	21	53.8	-	-	7	17.9	3	7.7
Selection	7	17.9	22	56.4	-	-	7	17.9	3	7.7
Merging	8	20.5	21	53.8	-	-	7	17.9	3	7.7
Tabulators--Accounting Machines										
Functions	17	43.6	17	43.6	-	-	3	7.7	2	5.1
Features	17	43.6	17	43.6	-	-	3	7.7	2	5.1
Control Panel										
Detail printing	16	41.0	13	33.3	-	-	6	15.4	4	10.3
Program control	16	41.0	12	30.8	-	-	7	17.9	4	10.3
Addition and subtraction	16	41.0	13	33.3	-	-	7	17.9	3	7.7
Group printing and indication	14	35.9	14	35.9	-	-	7	17.9	4	10.3
Selective printing	12	30.8	16	41.0	-	-	6	15.4	5	12.8
Summary punching	9	23.1	15	38.5	1	2.6	9	23.1	5	12.8

Appendix II - Table 2 continued

Content	Degree of Coverage									
	Vocational Competency		Background Information		Covered in Text --Not in Class		Not Covered		No Response	
	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]
Calculators										
Functions	5	12.8	16	41.0	1	2.6	14	35.9	3	7.7
Features	5	12.8	16	41.0	1	2.6	14	35.9	3	7.7
Control panel										
Add	5	12.8	8	20.5	1	2.6	17	43.6	8	20.5
Subtract	5	12.8	9	23.1	1	2.6	17	43.6	7	17.9
Multiply	4	10.3	9	23.1	1	2.6	17	43.6	8	20.5
Electronic Data Processing										
Components of Systems										
Stored programs	6	15.4	21	53.8	1	2.6	11	28.2	-	-
Elements of problem-solving	7	17.9	17	43.6	1	2.6	12	30.8	2	5.1
Central processing unit	4	10.3	20	51.3	1	2.6	14	35.9	-	-
Primary storage	5	12.8	19	48.7	1	2.6	14	35.9	-	-
Arithmetic unit	6	15.4	20	51.3	1	2.6	12	30.8	-	-
Logic ability	5	12.8	16	41.0	1	2.6	17	43.6	-	-
Documentation	3	7.7	14	35.9	1	2.6	18	46.2	3	7.7
Types of Systems										
Manual	2	5.1	18	46.2	-	-	14	35.9	5	12.8
Mechanical	2	5.1	18	46.2	-	-	14	35.9	5	12.8
Electrical	3	7.7	19	48.7	-	-	14	35.9	3	7.7
Input-Output Media										
Card reader	6	15.4	17	43.6	-	-	16	41.0	-	-
Card punch	8	20.5	15	38.5	-	-	16	41.0	-	-

Appendix II - Table 2 continued

Content	Degree of Coverage									
	Vocational Competency		Background Information		Covered in Text --Not in Class		Not Covered		No Response	
	No.	Percent^1	No.	Percent^1	No.	Percent^1	No.	Percent^1	No.	Percent^1
Input-Output Media (continued)										
Magnetic tape unit	2	5.1	19	48.7	-	-	18	46.2	-	-
Paper tape reader	3	7.7	22	56.4	-	-	14	35.9	-	-
Paper tape punch	3	7.7	22	56.4	-	-	14	35.9	-	-
Magnetic character sensing	1	2.6	23	59.0	-	-	14	35.9	1	2.6
Optical reader	2	5.1	20	51.3	-	-	16	41.0	1	2.6
Printers	6	15.4	17	43.6	-	-	15	38.5	1	2.6
Random access devices	2	5.1	18	46.2	-	-	18	46.2	1	2.6
Internal Processing										
Loading the stored program	8	20.5	12	30.8	-	-	16	41.0	3	7.7
Accessing	6	15.4	10	25.7	-	-	19	48.7	4	10.3
Registers	6	15.4	10	25.7	-	-	19	48.7	4	10.3
Data flow	6	15.4	11	28.2	-	-	18	46.2	4	10.3
Computer Characteristics										
Analog and digital	-	-	22	56.4	-	-	17	43.6	-	-
Serial and parallel	-	-	11	28.2	-	-	26	66.7	2	5.1
Buffered and unbuffered	2	5.1	7	17.9	-	-	27	69.2	3	7.7
Sequential and nonsequential	2	5.1	12	30.8	-	-	23	59.0	2	5.1
Numeric and alphanumeric	4	10.3	16	41.0	-	-	18	46.2	1	2.6
Variable and fixed	3	7.7	16	41.0	-	-	19	48.7	1	2.6

Appendix II - Table 2 continued

Content	Degree of Coverage: Vocational Competency No.	Degree of Coverage: Vocational Competency Percent[1]	Degree of Coverage: Background Information No.	Degree of Coverage: Background Information Percent[1]	Covered in Text --Not in Class No.	Covered in Text --Not in Class Percent[1]	Not Covered No.	Not Covered Percent[1]	No Response No.	No Response Percent[1]
Organization of the Data Processing										
Components	3	7.7	18	46.2	-	-	14	35.9	4	10.3
Functions	3	7.7	18	46.2	-	-	16	41.0	2	5.1
Features	3	7.7	18	46.2	-	-	16	41.0	2	5.1
Speed	3	7.7	18	46.2	-	-	16	41.0	2	5.1
Instruction format	5	12.8	17	43.6	-	-	16	41.0	1	2.6
Storage organization	4	10.3	18	46.2	-	-	16	41.0	1	2.6
Coding systems	4	10.3	17	43.6	-	-	17	43.6	1	2.6
Addressing scheme	4	10.3	16	41.0	-	-	17	43.6	2	5.1
Instruction and data flow	3	7.7	16	41.0	-	-	17	43.6	3	7.7
Registers	3	7.7	15	38.5	-	-	18	46.2	3	7.7
Instruction phase	3	7.7	13	33.3	-	-	19	48.7	4	10.3
Execution phase	3	7.7	12	30.8	-	-	19	48.7	5	12.8
Man-Machine Communications										
Console control	2	5.1	16	41.0	-	-	17	43.6	4	10.3
Man to machine	2	5.1	17	43.6	-	-	17	43.6	3	7.7
Machine to man	2	5.1	17	43.6	-	-	17	43.6	3	7.7
Sense switch control	1	2.6	10	25.7	-	-	24	61.5	4	10.3
Inquiry stations	1	2.6	10	25.7	1	2.6	23	59.0	4	10.3
Machine to man printouts	2	5.1	13	33.3	-	-	20	51.3	4	10.3
Messages	1	2.6	12	30.8	-	-	22	56.4	4	10.3
Memory printouts	2	5.1	11	28.2	-	-	21	53.8	5	12.8

Appendix II - Table 2 continued

Content	Degree of Coverage				Covered in Text --Not in Class		Not Covered		No Response	
	Vocational Competency No.	Percent^1	Background Information No.	Percent^1	No.	Percent^1	No.	Percent^1	No.	Percent^1
Instructions: Card System										
Format control codes	6	15.4	10	25.7	-	-	19	48.7	4	10.3
Card system input-output instructions	5	12.8	9	23.1	-	-	21	53.8	4	10.3
Data movement instructions	6	15.4	9	23.1	-	-	20	51.3	4	10.3
Arithmetic	6	15.4	10	25.7	-	-	20	51.3	3	7.7
Branching	5	12.8	11	28.2	-	-	20	51.3	3	7.7
Logic instructions	6	15.4	10	25.7	-	-	20	51.3	3	7.7
Miscellaneous codes	6	15.4	8	20.5	-	-	20	51.3	5	12.8
Methods of Program Debugging										
Debugging a program before run time	6	15.4	10	25.7	-	-	22	56.4	1	2.6
Debugging a program at run time	5	12.8	7	17.9	-	-	25	64.1	2	5.1
Programming for ease of checkout	6	15.4	4	10.3	-	-	26	66.7	3	7.7
Housekeeping Techniques	3	7.7	3	7.7	-	-	24	61.5	9	23.1
Loops and Indexing										
Steps in programming a loop	6	15.4	9	23.1	-	-	20	51.3	4	10.3
Index registers	5	12.8	8	20.5	-	-	21	53.8	5	12.8
Various types of loops	6	15.4	9	23.1	-	-	21	53.8	3	7.7
Subroutines										
The use of subroutines	6	15.4	7	17.9	-	-	21	53.8	5	12.8
Subroutines and calling sequence	5	12.8	7	17.9	-	-	22	56.4	5	12.8
The software as a computer	4	10.3	7	17.9	-	-	23	59.0	5	12.8

Appendix II - Table 2 continued

Content	Degree of Coverage				Covered in Text --Not in Class		Not Covered		No Response	
	Vocational Competency		Background Information							
	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]
Programming a Tape System										
Magnetic tape characteristics	1	2.6	9	23.1	-	-	27	69.2	2	5.1
Magnetic tape file organization	1	2.6	6	15.4	-	-	30	76.9	2	5.1
Instructions	1	2.6	5	12.8	-	-	31	79.5	2	5.1
End-of-reel, file, job routines	1	2.6	2	5.1	-	-	34	87.2	2	5.1
Timing individual tape operations	-	-	3	7.7	-	-	34	87.2	2	5.1
The medium-scale tape system in support of a large-scale data processing system	-	-	3	7.7	-	-	33	84.6	3	7.7
Programming a Random Access Device										
Random access characteristics	1	2.6	9	23.1	-	-	28	71.8	1	2.6
Random access file organization	1	2.6	6	15.4	-	-	30	76.9	2	5.1
Instructions	1	2.6	4	10.3	-	-	32	82.1	2	5.1
File loading routines	1	2.6	4	10.3	-	-	32	82.1	2	5.1
File dumping procedures	1	2.6	4	10.3	-	-	32	82.1	2	5.1
Timing random access operations	-	-	5	12.8	-	-	32	82.1	2	5.1
Inquiry station	1	2.6	3	7.7	-	-	33	84.6	2	5.1
Program Testing										
Program listings	8	20.5	8	20.5	-	-	22	56.4	1	2.6
Test data	8	20.5	8	20.5	-	-	22	56.4	1	2.6
Operating instructions	8	20.5	8	20.5	-	-	22	56.4	1	2.6
Checklists	8	20.5	6	15.4	-	-	24	61.5	1	2.6
Precalculated answers	8	20.5	7	17.9	-	-	23	59.0	1	2.6
Desk checking	8	20.5	7	17.9	-	-	23	59.0	1	2.6
Debugging techniques	8	20.5	7	17.9	-	-	23	59.0	1	2.6

Appendix II - Table 2 continued

Content	Degree of Coverage				Covered in Text --Not in Class		Not Covered		No Response	
	Vocational Competency		Background Information							
	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]
Programming Systems										
The language	8	20.5	11	28.2	-	-	17	43.6	3	7.7
The processor	6	15.4	11	28.2	-	-	21	53.8	1	2.6
Advantages--disadvantages	6	15.4	7	17.9	-	-	24	61.5	2	5.1
Assembly Programs and Compilers	5	12.8	8	20.5	-	-	24	61.5	2	5.1
Macro Generators	3	7.7	3	7.7	-	-	30	76.9	3	7.7
Report Generators	2	5.1	3	7.7	-	-	31	79.5	3	7.7
Data Scheduling Systems--Tape										
Scheduling function	1	2.6	2	5.1	-	-	31	79.5	5	12.8
Blocking-deblocking function	1	2.6	2	5.1	-	-	31	79.5	5	12.8
Error correction function	1	2.6	2	5.1	-	-	31	79.5	5	12.8
End of operation functions	1	2.6	2	5.1	-	-	31	79.5	5	12.8
Tape labeling functions	1	2.6	2	5.1	-	-	30	76.9	6	15.4
Checkpoint and restart functions	1	2.6	2	5.1	-	-	31	79.5	5	12.8
Disc file area	1	2.6	2	5.1	-	-	31	79.5	5	12.8
Sort-Merge										
Internal sort	-	-	7	17.9	-	-	30	76.9	2	5.1
Merge	-	-	5	12.8	-	-	31	79.5	3	7.7

Appendix II - Table 2 continued

Content	Degree of Coverage				Covered in Text --Not in Class		Not Covered		No Response	
	Vocational Competency		Background Information							
	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]
Monitors										
Concept	-	-	5	12.8	-	-	29	74.4	5	12.8
Application areas	-	-	3	7.7	-	-	30	76.9	6	15.4
Languages										
COBOL	2	5.1	7	17.9	2	5.1	26	66.7	2	5.1
Fortran II	3	7.7	6	15.4	1	2.6	26	66.7	3	7.7
Fortran IV	3	7.7	5	12.8	2	5.1	23	59.0	6	15.4
Autocoder	1	2.6	2	5.1	1	2.6	30	76.9	5	12.8
SPS	1	2.6	5	12.8	-	-	28	71.8	5	12.8
PL-1	-	-	1	2.6	-	-	32	82.1	6	15.4
Neat	-	-	-	-	-	-	33	84.6	6	15.4

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1. Additions of percentages will vary from 99.9 to 100.1 because of rounding off.

APPENDIX II

TABLE 3

VOCATIONAL-TECHNICAL SCHOOLS BY CONTENT COVERED AND DEGREE OF COVERAGE, 1967-1968

Content	Degree of Coverage									
	Vocational Competency		Background Information		Covered in Text --Not in Class		Not Covered		No Response	
	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]
The Business Organization										
Function of business	3	15.8	16	84.2	-	-	-	-	-	-
Classifications of business	3	15.8	15	78.9	-	-	1	5.3	-	-
Systems concept	7	36.8	11	57.9	-	-	1	5.3	-	-
Organizational structure	6	31.6	13	68.4	-	-	-	-	-	-
Forms: flow chart	15	78.9	4	21.1	-	-	-	-	-	-
Procedures: flow	13	68.4	6	31.6	-	-	-	-	-	-
Unit-Record										
Card format	19	100.0	-	-	-	-	-	-	-	-
Card code	19	100.0	-	-	-	-	-	-	-	-
Control punches	19	100.0	-	-	-	-	-	-	-	-
Card field	19	100.0	-	-	-	-	-	-	-	-
Machine Functions										
Recording	17	89.5	1	5.3	-	-	1	5.3	-	-
Classifying	16	84.2	2	10.5	-	-	1	5.3	-	-
Calculating	17	89.5	1	5.3	-	-	1	5.3	-	-
Interpreting	16	84.2	2	10.5	-	-	1	5.3	-	-
Report preparation	17	89.5	1	5.3	-	-	1	5.3	-	-
Storing	17	89.5	1	5.3	-	-	1	5.3	-	-

Appendix II - Table 3 continued

Content	Degree of Coverage				Covered in Text --Not in Class		Not Covered		No Response	
	Vocational Competency No.	Percent[1]	Background Information No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]
The Card Punch and Verifier										
Functions	18	94.7	1	5.3	-	-	-	-	-	-
Features	18	94.7	1	5.3	-	-	-	-	-	-
Alphabetic and numeric punching	18	94.7	1	5.3	-	-	-	-	-	-
Duplicating	18	94.7	1	5.3	-	-	-	-	-	-
The control card	18	94.7	1	5.3	-	-	-	-	-	-
Verification	14	73.7	4	21.1	-	-	-	-	1	5.3
Sorter										
Functions	18	94.7	1	5.3	-	-	-	-	-	-
Features	18	94.7	1	5.3	-	-	-	-	-	-
Operating procedures	18	94.7	1	5.3	-	-	-	-	-	-
Numerical and alphabetic sorting	18	94.7	1	5.3	-	-	-	-	-	-
Block sorting	17	89.5	2	10.5	-	-	-	-	-	-
Interpreter										
Functions	11	57.9	6	31.6	1	5.3	-	-	1	5.3
Features	10	52.6	5	26.3	1	5.3	1	5.3	2	10.5
The column split	9	47.4	4	21.1	1	5.3	2	10.5	3	15.8
Interpreting	9	47.4	4	21.1	1	5.3	2	10.5	3	15.8
The selector	9	47.4	4	21.1	1	5.3	2	10.5	3	15.8
Interpreting with selection	10	52.6	2	10.5	1	5.3	2	10.5	4	21.1

Appendix II - Table 3 continued

Content	Degree of Coverage				Covered in Text --Not in Class		Not Covered		No Response	
	Vocational Competency No.	Percent[1]	Background Information No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]
Reproducing Punch										
Functions	15	78.9	3	15.8	-	-	-	-	1	5.3
Features	15	78.9	3	15.8	-	-	-	-	1	5.3
Operating procedures	15	78.9	2	10.5	-	-	1	5.3	1	5.3
Reproducing	15	78.9	2	10.5	-	-	1	5.3	1	5.3
Gang punching	15	78.9	2	10.5	-	-	1	5.3	1	5.3
Verifying	13	68.4	3	15.8	-	-	2	10.5	1	5.3
Collator										
Functions	14	73.7	2	10.5	-	-	1	5.3	2	10.5
Features	14	73.7	2	10.5	-	-	1	5.3	2	10.5
Operating procedures	14	73.7	1	5.3	-	-	2	10.5	2	10.5
Sequence checking	14	73.7	1	5.3	-	-	2	10.5	2	10.5
Selection	14	73.7	1	5.3	-	-	2	10.5	2	10.5
Merging	15	78.9	-	-	-	-	2	10.5	2	10.5
Tabulators--Accounting Machines										
Functions	15	78.9	1	5.3	-	-	1	5.3	2	10.5
Features	15	78.9	1	5.3	-	-	1	5.3	2	10.5
Control Panel										
Detail printing	15	78.9	-	-	-	-	2	10.5	2	10.5
Program control	15	78.9	-	-	-	-	2	10.5	2	10.5
Addition and subtraction	15	78.9	-	-	-	-	2	10.5	2	10.5
Group printing and indication	15	78.9	-	-	-	-	2	10.5	2	10.5
Selective printing	15	78.9	-	-	-	-	2	10.5	2	10.5
Summary punching	14	73.7	-	-	-	-	3	15.8	2	10.5

Appendix II - Table 3 continued

Content	Degree of Coverage									
	Vocational Competency		Background Information		Covered in Text --Not in Class		Not Covered		No Response	
	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]
Calculators										
Functions	4	21.1	4	21.1	2	10.5	6	31.6	3	15.8
Features	4	21.1	4	21.1	2	10.5	6	31.6	3	15.8
Control. Panel										
Add	4	21.1	2	10.5	3	15.8	8	42.1	2	10.5
Subtract	4	21.1	2	10.5	3	15.8	8	42.1	2	10.5
Multiply	4	21.1	2	10.5	3	15.8	8	42.1	2	10.5
Electronic Data Processing										
Components of System										
Stored Programs	13	68.4	5	26.3	-	-	-	-	1	5.3
Elements of problem-solving	13	68.4	5	26.3	-	-	-	-	1	5.3
Central processing unit	13	68.4	5	26.3	-	-	-	-	1	5.3
Primary storage	13	68.4	5	26.3	-	-	-	-	1	5.3
Arithmetic unit	12	63.2	6	31.6	-	-	-	-	1	5.3
Logic ability	14	73.7	4	21.1	-	-	-	-	1	5.3
Documentation	14	73.7	4	21.1	-	-	-	-	1	5.3
Types of Systems										
Manual	9	47.4	6	31.6	-	-	1	5.3	3	15.8
Mechanical	10	52.6	5	26.3	-	-	1	5.3	3	15.8
Electrical	13	68.4	5	26.3	-	-	-	-	1	5.3
Input-Output Media										
Card reader	15	78.9	3	15.8	-	-	-	-	1	5.3
Card punch	15	78.9	3	15.8	-	-	-	-	1	5.3

Appendix II - Table 3 continued

Content	Degree of Coverage									
	Vocational Competency		Background Information		Covered in Text --Not in Class		Not Covered		No Response	
	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]
Input-Output Media (continued)										
Magnetic tape unit	7	36.8	11	57.9	-	-	-	-	1	5.3
Paper tape reader	5	26.3	11	57.9	1	5.3	-	-	2	10.5
Paper tape punch	5	26.3	11	57.9	1	5.3	-	-	2	10.5
Magnetic character sensing	3	15.8	13	68.4	-	-	2	10.5	1	5.3
Optical reader	2	10.5	12	63.2	1	5.3	2	10.5	2	10.5
Printers	10	52.6	8	42.1	-	-	-	-	1	5.3
Random access devices	9	47.4	8	42.1	-	-	1	5.3	1	5.3
Internal Processing										
Loading the stored program	15	78.9	3	15.8	-	-	-	-	1	5.3
Accessing	14	73.7	4	21.1	-	-	-	-	1	5.3
Registers	13	68.4	5	26.3	-	-	-	-	1	5.3
Data flow	15	78.9	3	15.8	-	-	-	-	1	5.3
Computer Characteristics										
Analog and digital	9	47.4	8	42.1	-	-	1	5.3	1	5.3
Serial and parallel	7	36.8	6	31.6	-	-	4	21.1	2	10.5
Buffered and unbuffered	8	42.1	6	31.6	1	5.3	2	10.5	2	10.5
Sequential and nonsequential	11	57.9	7	36.8	-	-	-	-	1	5.3
Numeric and alphanumeric	13	68.4	4	21.1	1	5.3	-	-	1	5.3
Variable and fixed	12	63.2	5	26.3	1	5.3	-	-	1	5.3

Appendix II - Table 3 continued

Content	Degree of Coverage				Covered in Text --Not in Class		Not Covered		No Response	
	Vocational Competency		Background Information							
	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]
Organization of the Data Processing	10	52.6	5	26.3	2	10.5	1	5.3	1	5.3
Components	10	52.6	5	26.3	2	10.5	1	5.3	1	5.3
Functions	10	52.6	5	26.3	2	10.5	1	5.3	1	5.3
Features	11	57.9	4	21.1	2	10.5	1	5.3	1	5.3
Speed	13	68.4	2	10.5	1	5.3	2	10.5	1	5.3
Instruction format	14	73.7	2	10.5	1	5.3	1	5.3	1	5.3
Storage organization	14	73.7	2	10.5	1	5.3	1	5.3	1	5.3
Coding systems	14	73.7	2	10.5	1	5.3	1	5.3	1	5.3
Addressing scheme	13	68.4	3	15.8	1	5.3	1	5.3	1	5.3
Instruction and data flow	13	68.4	3	15.8	1	5.3	1	5.3	1	5.3
Registers	14	73.7	2	10.5	1	5.3	1	5.3	1	5.3
Instruction phase	14	73.7	2	10.5	1	5.3	1	5.3	1	5.3
Execution phase										
Man-Machine Communications	15	78.9	1	5.3	1	5.3	1	5.3	1	5.3
Console control	15	78.9	1	5.3	1	5.3	1	5.3	1	5.3
Man to machine	15	78.9	1	5.3	1	5.3	1	5.3	1	5.3
Machine to man	14	73.7	2	10.5	1	5.3	1	5.3	1	5.3
Sense switch control	10	52.6	4	21.1	2	10.5	2	10.5	1	5.3
Inquiry stations	12	63.2	4	21.1	1	5.3	1	5.3	1	5.3
Machine to man printouts	15	78.9	1	5.3	1	5.3	1	5.3	1	5.3
Messages	14	73.7	1	5.3	1	5.3	2	10.5	1	5.3
Memory printouts										

Appendix II - Table 3 continued

Content	Degree of Coverage				Covered in Text --Not in Class		Not Covered		No Response	
	Vocational Competency No.	Percent[1]	Background Information No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]
Instructions: Card System										
Format control codes	15	78.9	2	10.5	-	-	1	5.3	1	5.3
Card system input-output instructions	15	78.9	2	10.5	-	-	1	5.3	1	5.3
Data movement instructions	15	78.9	2	10.5	-	-	1	5.3	1	5.3
Arithmetic	15	78.9	2	10.5	-	-	1	5.3	1	5.3
Branching	15	78.9	2	10.5	-	-	1	5.3	1	5.3
Logic instructions	15	78.9	2	10.5	-	-	1	5.3	1	5.3
Miscellaneous codes	15	78.9	2	10.5	-	-	1	5.3	1	5.3
Methods of Program Debugging										
Debugging a program before run time	16	84.2	1	5.3	-	-	1	5.3	1	5.3
Debugging a program at run time	16	84.2	1	5.3	-	-	1	5.3	1	5.3
Programming for ease of checkout	12	63.2	4	21.1	-	-	1	5.3	2	10.5
Housekeeping Techniques	12	63.2	3	15.8	-	-	1	5.3	3	15.8
Loops and Indexing										
Steps in programming a loop	12	63.2	4	21.1	-	-	1	5.3	2	10.5
Index registers	11	57.9	4	21.1	-	-	1	5.3	3	15.8
Various types of loops	11	57.9	3	15.8	-	-	1	5.3	4	21.1
Subroutines										
The use of subroutines	10	52.6	4	21.1	1	5.3	2	10.5	2	10.5
Subroutines and calling sequence	9	47.4	5	26.3	1	5.3	2	10.5	2	10.5
The software as a computer	5	26.3	7	36.8	1	5.3	2	10.5	4	21.1

Appendix II - Table 3 continued

Content	Degree of Coverage				Covered in Text --Not in Class		Not Covered		No Response	
	Vocational Competency		Background Information							
	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]
Programming a Tape System										
Magnetic tape characteristics	6	31.6	9	47.4	-	-	3	15.8	1	5.3
Magnetic tape file organization	6	31.6	9	47.4	-	-	3	15.8	1	5.3
Instructions	6	31.6	7	36.8	1	5.3	4	21.1	1	5.3
End-of-reel, file, job routines	7	36.8	7	36.8	1	5.3	3	15.8	1	5.3
Timing individual tape operations	2	10.5	11	57.9	1	5.3	3	15.8	2	10.5
The medium-scale tape system in support of a large-scale data processing system	2	10.5	9	47.4	1	5.3	5	26.3	2	10.5
Programming a Random Access Device										
Random access characteristics	7	36.8	8	42.1	1	5.3	2	10.5	1	5.3
Random access file organization	7	36.8	6	31.6	2	10.5	3	15.8	1	5.3
Instructions	7	36.8	4	21.1	3	15.8	4	21.1	1	5.3
File loading routines	7	36.8	4	21.1	3	15.8	4	21.1	1	5.3
File dumping procedures	7	36.8	4	21.1	3	15.8	4	21.1	1	5.3
Timing random access operations	5	26.3	6	31.6	3	15.8	4	21.1	1	5.3
Inquiry station	7	36.8	3	15.8	3	15.8	5	26.3	1	5.3
Program Testing										
Program listings	14	73.7	1	5.3	2	10.5	1	5.3	1	5.3
Test data	13	68.4	1	5.3	2	10.5	2	10.5	1	5.3
Operating instructions	12	63.2	3	15.8	2	10.5	1	5.3	1	5.3
Checklists	12	63.2	3	15.8	2	10.5	1	5.3	1	5.3
Precalculated answers	13	68.4	2	10.5	2	10.5	1	5.3	1	5.3
Desk checking	13	68.4	2	10.5	2	10.5	1	5.3	1	5.3
Debugging techniques	13	68.4	2	10.5	2	10.5	1	5.3	1	5.3

Appendix II - Table 3 continued

Content	Degree of Coverage				Covered in Text --Not in Class		Not Covered		No Response	
	Vocational Competency		Background Information							
	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]
Programming Systems										
The language	12	63.2	2	10.5	2	10.5	1	5.3	2	10.5
The processor	11	57.9	2	10.5	2	10.5	2	10.5	2	10.5
Advantages--disadvantages	10	52.6	4	21.1	2	10.5	1	5.3	2	10.5
Assembly Programs and Compilers	11	57.9	2	10.5	1	5.3	3	15.8	2	10.5
Macro Generators	6	31.6	6	31.6	1	5.3	4	21.1	2	10.5
Report Generators	5	26.3	6	31.6	1	5.3	5	26.3	2	10.5
Data Scheduling Systems--Tape										
Scheduling function	3	15.8	8	42.1	1	5.3	4	21.1	3	15.8
Blocking-deblocking function	2	10.5	9	47.4	1	5.3	4	21.1	3	15.8
Error correction function	4	21.1	7	36.8	1	5.3	4	21.1	3	15.8
End of operation functions	5	26.3	6	31.6	1	5.3	4	21.1	3	15.8
Tape labeling functions	5	26.3	6	31.6	1	5.3	4	21.1	3	15.8
Checkpoint and restart functions	3	15.8	7	36.8	1	5.3	5	26.3	3	15.8
Disc file area	3	15.8	7	36.8	1	5.3	5	26.3	3	15.8
Sort-Merge										
Internal sort	8	42.1	3	15.8	1	5.3	4	21.1	3	15.8
Merge	7	36.8	2	10.5	1	5.3	5	26.3	4	21.1

Appendix II - Table 3 continued

Content	Degree of Coverage				Covered in Text --Not in Class		Not Covered		No Response	
	Vocational Competency		Background Information							
	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]
Monitors										
Concept	2	10.5	5	26.3	1	5.3	7	36.8	4	21.1
Application areas	1	5.3	4	21.1	1	5.3	7	36.8	6	31.6
Languages										
COBOL	4	21.1	4	21.1	1	5.3	5	26.3	5	26.3
Fortran II	6	31.6	2	10.5	1	5.3	6	31.6	4	21.1
Fortran IV	3	15.8	6	31.6	2	10.5	4	21.1	4	21.1
Autocoder	3	15.8	5	26.3	1	5.3	6	31.6	4	21.1
SPS	4	21.1	3	15.8	-	-	8	42.1	4	21.1
PL-1	2	10.5	2	10.5	1	5.3	9	47.4	5	26.3
Neat	1	5.3	-	-	-	-	12	63.2	6	31.6

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1. Additions of percentages will vary from 99.9 to 100.1 because of rounding off.

APPENDIX II

TABLE 4

PUBLICLY SUPPORTED TWO-YEAR COLLEGES BY CONTENT COVERED AND DEGREE OF COVERAGE

Content	Degree of Coverage				Covered in Text --Not in Class		Not Covered		No Response	
	Vocational Competency No.	Percent[1]	Background Information No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]
The Business Organization										
Function of business	1	7.1	9	64.3	-	-	3	21.4	1	7.1
Classifications of business	1	7.1	8	57.1	1	7.1	3	21.4	1	7.1
Systems concept	7	50.0	4	28.6	-	-	2	14.3	1	7.1
Organizational structure	1	7.1	10	71.4	-	-	2	14.3	1	7.1
Forms: flow chart	8	57.1	3	21.4	-	-	2	14.3	1	7.1
Procedures: flow	9	64.3	2	14.3	-	-	2	14.3	1	7.1
Unit Record										
Card format	9	64.3	3	21.4	-	-	1	7.1	1	7.1
Card code	9	64.3	3	21.4	-	-	1	7.1	1	7.1
Control punches	9	64.3	3	21.4	-	-	1	7.1	1	7.1
Card field	10	71.4	2	14.3	-	-	1	7.1	1	7.1
Machine Functions										
Recording	8	57.1	3	21.4	-	-	1	7.1	2	14.3
Classifying	7	50.0	4	28.6	-	-	1	7.1	2	14.3
Calculating	6	42.9	5	35.7	-	-	1	7.1	2	14.3
Interpreting	7	50.0	4	28.6	-	-	1	7.1	2	14.3
Report preparation	8	57.1	3	21.4	-	-	1	7.1	2	14.3
Storing	7	50.0	3	21.4	1	7.1	1	7.1	2	14.3

Appendix II - Table 4 continued

Content	Degree of Coverage									
	Vocational Competency		Background Information		Covered in Text --Not in Class		Not Covered		No Response	
	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]
The Card Punch and Verifier										
Functions	8	57.1	4	28.6	-	-	1	7.1	1	7.1
Features	7	50.0	5	35.7	-	-	1	7.1	1	7.1
Alphabetic and numeric punching	7	50.0	5	35.7	-	-	1	7.1	1	7.1
Duplicating	7	50.0	5	35.7	-	-	1	7.1	1	7.1
The control card	7	50.0	5	35.7	-	-	1	7.1	1	7.1
Verification	3	21.4	7	50.0	1	7.1	2	14.3	1	7.1
Sorter										
Functions	8	57.1	3	21.4	-	-	2	14.3	1	7.1
Features	7	50.0	4	28.6	-	-	2	14.3	1	7.1
Operating procedures	7	50.0	4	28.6	-	-	2	14.3	1	7.1
Numerical and alphabetic sorting	7	50.0	4	28.6	-	-	2	14.3	1	7.1
Block sorting	6	42.9	5	35.7	-	-	2	14.3	1	7.1
Interpreter										
Functions	4	28.6	5	35.7	1	7.1	3	21.4	1	7.1
Features	3	21.4	6	42.9	1	7.1	3	21.4	1	7.1
The column split	3	21.4	3	21.4	1	7.1	6	42.9	1	7.1
Interpreting	3	21.4	4	28.6	1	7.1	5	35.7	1	7.1
The selector	2	14.3	3	21.4	2	14.3	6	42.9	1	7.1
Interpreting with selection	2	14.3	3	21.4	2	14.3	6	42.9	1	7.1

Appendix II - Table 4 continued

Content	Degree of Coverage									
	Vocational Competency No.	Vocational Competency Percent[1]	Background Information No.	Background Information Percent[1]	Covered in Text --Not in Class No.	Covered in Text --Not in Class Percent[1]	Not Covered No.	Not Covered Percent[1]	No Response No.	No Response Percent[1]
Reproducing Punch										
Functions	5	35.7	5	35.7	-	-	3	21.4	1	7.1
Features	4	28.6	5	35.7	1	7.1	3	21.4	1	7.1
Operating procedures	3	21.4	4	28.6	2	14.3	4	28.6	1	7.1
Reproducing	3	21.4	5	35.7	1	7.1	4	28.6	1	7.1
Gang punching	3	21.4	5	35.7	-	-	5	35.7	1	7.1
Verifying	3	21.4	5	35.7	-	-	5	35.7	1	7.1
Collator										
Functions	6	42.9	4	28.6	-	-	3	21.4	1	7.1
Features	6	42.9	4	28.6	-	-	3	21.4	1	7.1
Operating procedures	3	21.4	5	35.7	1	7.1	4	28.6	1	7.1
Sequence checking	4	28.6	5	35.7	-	-	4	28.6	1	7.1
Selection	4	28.6	5	35.7	-	-	4	28.6	1	7.1
Merging	4	28.6	5	35.7	-	-	4	28.6	1	7.1
Tabulators--Accounting Machines										
Functions	6	42.9	3	21.4	1	7.1	3	21.4	1	7.1
Features	5	35.7	4	28.6	1	7.1	3	21.4	1	7.1
Control Panel										
Detail printing	6	42.9	3	21.4	-	-	4	28.6	1	7.1
Program control	6	42.9	3	21.4	-	-	4	28.6	1	7.1
Addition and subtraction	6	42.9	3	21.4	-	-	4	28.6	1	7.1
Group printing and indication	6	42.9	3	21.4	-	-	4	28.6	1	7.1
Selective printing	6	42.9	3	21.4	-	-	4	28.6	1	7.1
Summary punching	2	14.3	5	35.7	2	14.3	4	28.6	1	7.1

Appendix II - Table 4 continued

Content	Degree of Coverage Vocational Competency No.	 Percent[1]	 Background Information No.	 Percent[1]	Covered in Text --Not in Class No.	 Percent[1]	Not Covered No.	 Percent[1]	No Response No.	 Percent[1]
Calculators										
Functions	2	14.3	5	35.7	1	7.1	4	28.6	2	14.3
Features	1	7.1	6	42.9	1	7.1	4	28.6	2	14.3
Control Panel										
Add	-	-	4	28.6	2	14.3	7	50.0	1	7.1
Subtract	-	-	4	28.6	2	14.3	7	50.0	1	7.1
Multiply	-	-	4	28.6	2	14.3	7	50.0	1	7.1
Electronic Data Processing										
Components of System										
Stored programs	10	71.4	3	21.4	-	-	1	7.1	-	-
Elements of problem-solving	10	71.4	3	21.4	-	-	1	7.1	-	-
Central processing unit	9	64.3	4	28.6	-	-	1	7.1	-	-
Primary storage	9	64.3	4	28.6	-	-	1	7.1	-	-
Arithmetic unit	9	64.3	4	28.6	-	-	1	7.1	-	-
Logic ability	10	71.4	3	21.4	-	-	1	7.1	-	-
Documentation	9	64.3	2	14.3	1	7.1	2	14.3	-	-
Types of Systems										
Manual	4	28.6	6	42.9	1	7.1	3	21.4	-	-
Mechanical	5	35.7	5	35.7	1	7.1	3	21.4	-	-
Electrical	5	35.7	6	42.9	1	7.1	2	14.3	-	-
Input-Output Media										
Card reader	8	57.1	5	35.7	1	7.1	-	-	-	-
Card punch	8	57.1	4	28.6	2	14.3	-	-	-	-

Appendix II - Table 4 continued

Content	Degree of Coverage									
	Vocational Competency		Background Information		Covered in Text --Not in Class		Not Covered		No Response	
	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]
Input-Output Media (continued)										
Magnetic tape unit	4	28.6	7	50.0	2	14.3	1	7.1	-	-
Paper tape reader	1	7.1	10	71.4	1	7.1	1	7.1	1	7.1
Paper tape punch	1	7.1	10	71.4	-	-	2	14.3	1	7.1
Magnetic character sensing	2	14.3	8	57.1	-	-	3	21.4	1	7.1
Optical reader	1	7.1	9	64.3	1	7.1	2	14.3	1	7.1
Printers	8	57.1	3	21.4	2	14.3	1	7.1	-	-
Random access devices	7	50.0	4	28.6	1	7.1	1	7.1	1	7.1
Internal Processing										
Loading the stored program	9	64.3	2	14.3	-	-	2	14.3	1	7.1
Accessing	9	64.3	2	14.3	-	-	2	14.3	1	7.1
Registers	8	57.1	3	21.4	-	-	2	14.3	1	7.1
Data flow	8	57.1	3	21.4	-	-	2	14.3	1	7.1
Computer Characteristics										
Analog and digital	4	28.6	7	50.0	-	-	2	14.3	1	7.1
Serial and parallel	2	14.3	8	57.1	1	7.1	2	14.3	1	7.1
Buffered and unbuffered	2	14.3	8	57.1	1	7.1	2	14.3	1	7.1
Sequential and nonsequential	5	35.7	6	42.9	1	7.1	1	7.1	1	7.1
Numeric and alphanumeric	6	42.9	4	28.6	1	7.1	1	7.1	2	14.3
Variable and fixed	5	35.7	5	35.7	1	7.1	1	7.1	2	14.3

Appendix II - Table 4 continued

Content	Degree of Coverage				Covered in Text --Not in Class		Not Covered		No Response	
	Vocational Competency		Background Information							
	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]
Organization of the Data Processing										
Components	7	50.0	6	42.9	-	-	1	7.1	-	-
Functions	7	50.0	6	42.9	-	-	1	7.1	-	-
Features	7	50.0	6	42.9	-	-	1	7.1	-	-
Speed	8	57.1	5	35.7	-	-	1	7.1	-	-
Instruction format	10	71.4	3	21.4	-	-	1	7.1	-	-
Storage organization	10	71.4	2	14.3	-	-	1	7.1	1	7.1
Coding systems	11	78.6	1	7.1	-	-	1	7.1	1	7.1
Addressing scheme	10	71.4	1	7.1	-	-	2	14.3	1	7.1
Instruction and data flow	10	71.4	2	14.3	-	-	1	7.1	1	7.1
Registers	9	64.3	3	21.4	-	-	1	7.1	1	7.1
Instruction phase	9	64.3	3	21.4	-	-	1	7.1	1	7.1
Execution phase	9	64.3	3	21.4	-	-	1	7.1	1	7.1
Man-Machine Communications										
Console control	6	42.9	4	28.6	1	7.1	2	14.3	1	7.1
Man to machine	4	28.6	5	35.7	1	7.1	3	21.4	1	7.1
Machine to man	3	21.4	6	42.9	1	7.1	3	21.4	1	7.1
Sense switch control	5	35.7	4	28.6	1	7.1	3	21.4	1	7.1
Inquiry stations	4	28.6	4	28.6	2	14.3	3	21.4	1	7.1
Machine to man printouts	6	42.9	4	28.6	1	7.1	2	14.3	1	7.1
Messages	6	42.9	4	28.6	1	7.1	2	14.3	1	7.1
Memory printouts	6	42.9	3	21.4	1	7.1	3	21.4	1	7.1

Appendix II - Table 4 continued

Content	Degree of Coverage									
	Vocational Competency		Background Information		Covered in Text --Not in Class		Not Covered		No Response	
	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]
Instructions: Card System										
Format control codes	11	78.6	2	14.3	1	7.1	-	-	-	-
Card system input-output instructions	11	78.6	2	14.3	1	7.1	-	-	-	-
Data movement instructions	11	78.6	2	14.3	1	7.1	-	-	-	-
Arithmetic	12	85.7	1	7.1	1	7.1	-	-	-	-
Branching	12	85.7	1	7.1	-	-	1	7.1	-	-
Logic instructions	12	85.7	-	-	-	-	1	7.1	1	7.1
Miscellaneous codes	12	85.7	-	-	-	-	1	7.1	1	7.1
Methods of Program Debugging										
Debugging a program before run time	10	71.4	3	21.4	-	-	1	7.1	-	-
Debugging a program at run time	8	57.1	4	28.6	-	-	1	7.1	1	7.1
Programming for ease of checkout	8	57.1	4	28.6	-	-	2	14.3	-	-
Housekeeping Techniques	11	78.6	1	7.1	-	-	1	7.1	1	7.1
Loops and Indexing										
Steps in programming a loop	10	71.4	3	21.4	-	-	1	7.1	-	-
Index registers	10	71.4	1	7.1	-	-	2	14.3	1	7.1
Various types of loops	10	71.4	3	21.4	-	-	1	7.1	-	-
Subroutines										
The use of subroutines	12	85.7	1	7.1	-	-	1	7.1	-	-
Subroutines and calling sequence	12	85.7	1	7.1	-	-	1	7.1	-	-
The software as a computer	9	64.3	2	14.3	-	-	2	14.3	1	7.1

Appendix II - Table 4 continued

Content	Degree of Coverage				Covered in Text --Not in Class		Not Covered		No Response	
	Vocational Competency		Background Information							
	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]
Programming a Tape System										
Magnetic tape characteristics	4	28.6	6	42.9	-	-	3	21.4	1	7.1
Magnetic tape file organization	4	28.6	6	42.9	-	-	3	21.4	1	7.1
Instructions	5	35.7	5	35.7	-	-	3	21.4	1	7.1
End-of-reel, file, job routines	5	35.7	6	42.9	-	-	2	14.3	1	7.1
Timing individual tape operations	3	21.4	7	50.0	-	-	2	14.3	2	14.3
The medium-scale tape system in support of a large-scale data processing system	3	21.4	7	50.0	-	-	2	14.3	2	14.3
Programming a Random Access Device										
Random access characteristics	9	64.3	1	7.1	-	-	3	21.4	1	7.1
Random access file organization	9	64.3	1	7.1	-	-	3	21.4	1	7.1
Instructions	9	64.3	1	7.1	-	-	3	21.4	1	7.1
File loading routines	8	57.1	2	14.3	-	-	3	21.4	1	7.1
File dumping procedures	8	57.1	2	14.3	-	-	3	21.4	1	7.1
Timing random access operations	6	42.9	3	21.4	1	7.1	3	21.4	1	7.1
Inquiry station	5	35.7	4	28.6	-	-	4	28.6	1	7.1
Program Testing										
Program listings	11	78.6	-	-	1	7.1	1	7.1	1	7.1
Test data	11	78.6	-	-	1	7.1	1	7.1	1	7.1
Operating instructions	10	71.4	-	-	1	7.1	2	14.3	1	7.1
Checklists	10	71.4	-	-	1	7.1	2	14.3	1	7.1
Precalculated answers	10	71.4	-	-	1	7.1	2	14.3	1	7.1
Desk checking	10	71.4	-	-	1	7.1	2	14.3	1	7.1
Debugging techniques	10	71.4	-	-	1	7.1	2	14.3	1	7.1

Appendix II - Table 4 continued

Content	Degree of Coverage				Covered in Text --Not in Class		Not Covered		No Response	
	Vocational Competency		Background Information							
	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]
Programming Systems										
The language	11	78.6	1	7.1	1	7.1	1	7.1	-	-
The processor	11	78.6	1	7.1	-	-	2	14.3	-	-
Advantages--disadvantages	9	64.3	2	14.3	-	-	2	14.3	1	7.1
Assembly Programs and Compilers	7	50.0	3	21.4	1	7.1	2	14.3	1	7.1
Macro Generators	7	50.0	3	21.4	-	-	3	21.4	1	7.1
Report Generators	6	42.9	4	28.6	-	-	3	21.4	1	7.1
Data Scheduling Systems--Tape										
Scheduling function	2	14.3	7	50.0	1	7.1	2	14.3	2	14.3
Blocking-deblocking function	2	14.3	7	50.0	1	7.1	2	14.3	2	14.3
Error correction function	3	21.4	7	50.0	1	7.1	2	14.3	1	7.1
End of operation functions	4	28.6	6	42.9	1	7.1	2	14.3	1	7.1
Tape labeling functions	4	28.6	5	35.7	1	7.1	2	14.3	2	14.3
Checkpoint and restart functions	4	28.6	5	35.7	1	7.1	2	14.3	2	14.3
Disc file area	6	42.9	4	28.6	-	-	2	14.3	2	14.3
Sort-Merge										
Internal sort	8	57.1	3	21.4	-	-	2	14.3	1	7.1
Merge	8	57.1	3	21.4	-	-	2	14.3	1	7.1

Appendix II - Table 4 continued

Content	Degree of Coverage				Covered in Text --Not in Class		Not Covered		No Response	
	Vocational Competency		Background Information							
	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]	No.	Percent[1]
Monitors										
Concept	5	35.7	5	35.7	-	-	3	21.4	1	7.1
Application areas	5	35.7	5	35.7	-	-	3	21.4	1	7.1
Languages										
COBOL	9	64.3	1	7.1	-	-	1	7.1	3	21.4
Fortran II	6	42.9	4	28.6	-	-	3	21.4	1	7.1
Fortran IV	7	50.0	7	50.0	-	-	-	-	-	-
Autocoder	6	42.9	3	21.4	-	-	3	21.4	2	14.3
SPS	6	42.9	2	14.3	-	-	4	28.6	2	14.3
PL-1	1	7.1	2	14.3	1	7.1	8	57.1	2	14.3
Neat	-	-	2	14.3	-	-	10	71.4	2	14.3

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1. Additions of percentages will vary from 99.9 to 100.1 because of rounding off.

APPENDIX II

EXHIBIT 1

Eastern Montgomery County Area
Vocational-Technical School
175 Terwood Road
Willow Grove, Penna.

TOPICAL OUTLINE

INSTRUCTIONAL AREA Scientific Data Processing

Page 1 of 4

YEAR: 1st ____ 2nd X

MAJOR UNITS	CLOCK HOURS	SPECIFIC SKILL DEVELOPED IN TERMS OF JOB REQUIREMENTS	INSTRUCTIONAL AIDS EQUIPMENT, TEXTS OR OTHER TEACHING AIDS	EVALUATION OF PROGRESS AND ACHIEVEMENT
I Introduction to Scientific Data Processing	10	1 Understand Principles of Machine Operation a. Key Punch b. Sorter c. Interpreter d. Accounting Machine e. Document Originating Machine f. Calculating Punch g. Collator	026 Key Punch R3, S3, F3, 082 Sorter K3, L3, M3, N3, 548 Interpreter F3, G3, H3, I3, J3, 402 Accounting Machine 03, P3, T3, 519 Document Originating Machine B3, B4, 604-S21 Calculating Punch --- Y3 085 Collator U3, V3, W3, Z3, C4, D4, E4, F4	Oral Test Written Test Performance Test
		2 Control Panels a. Flow Charts b. Diagrams c. Wiring 1. Interpreter 2. Accounting Machine 3. Document Originating Machine 4. Calculating Punch 5. Collator	#548-F3, G3, H3, I3, J3, #402-03, P3, T3 #519-B3, X3, B4 #604-S21-Y3 #085-U3, V3, W3, Z3, C4, D4, E4, F4	Oral Test Written Test Performance Test

Eastern Montgomery County Area
Vocational-Technical School
175 Terwood Road
Willow Grove, Penna.

TOPICAL OUTLINE

INSTRUCTIONAL AREA Scientific Data Processing

Page 2 of 4

Year: 1st ____ 2nd X

MAJOR UNITS	CLOCK HOURS	SPECIFIC SKILL DEVELOPED IN TERMS OF JOB REQUIREMENTS	INSTRUCTIONAL AIDS EQUIPMENT, TEXTS OR OTHER TEACHING AIDS	EVALUATION OF PROGRESS AND ACHIEVEMENT
I Cont'd		3. Diagnose the reasons for a malfunction of a machine a. Card handling 1. Joggling 2. Fanning b. Jams 1. Brush Removal c. Panel Wiring 1. #548 2. #519 3. #402 4. #604-S21 5. #085	#026-R3, S3, F4 #548-F3, G3, H3, I3, J3 #402-03, P3, T3 #082-K3, L3, M3, N3 #519-B3, X3, B4 #604-521-Y3 #085-U3, V3, W3, Z3, C4, D4, E4, F4	Oral Test Written Test Performance Test
		4. Case Study a. Reports 1. Headings	S3, F4	
II Machine Language	10	1. Basic Principles a. Standardization 1. Numeric Codes 2. Alphabetic Codes 3. Special Defined Character Codes	S3, F4	Oral Test Written Test Performance Test (Sample Attached)
III Review of Key Punch 026 Functions, Techniques and Procedures	5	1. Principles of Punched Card Data a. Functions 1. Numeric Shift 2. Alphabetic Shift 3. Refister key, Multiple punch key b. Techniques and Procedures 1. Repunching of damaged cards 2. Correct error cards 3. Punch cards for duplication 4. "X" Punching	#026 R3, S3, F4	Oral Test Written Test Performance Test

TOPICAL OUTLINE

Eastern Montgomery County Area
Vocational-Technical School
175 Terwood Road
Willow Grove, Penna.

INSTRUCTIONAL AREA Scientific Data Processing

YEAR: 1st ____ 2nd X

Page 3 of 4

MAJOR UNITS	CLOCK HOURS	SPECIFIC SKILL DEVELOPED IN TERMS OF JOB REQUIREMENTS	INSTRUCTIONAL AIDS EQUIPMENT, TEXTS OR OTHER TEACHING AIDS	EVALUATION OF PROGRESS AND ACHIEVEMENT
IV Unit Record Machines Functions & Wiring	10	1. Interpreter a. Procedures & Applications 1. Flow Charts 2. Diagrams 3. Panel Wiring a. Upper Line Printing b. Lower Line Printing	#548 G3, H3, J3, Q3	Oral Test Written Test Performance Test
	10	2. Sorter a. Procedures & Applications 1. Numeric 2. Alphabetic 3. Block 4. Card selection	#082 K3, L3, M3, N3, F4	Oral Test Performance Test
	10	3. Collator a. Procedures & Applications 1. Flow Charts 2. Diagrams 3. Panel Wiring a. Sequence checking b. Merging c. Matching d. Selection	#085 Q3, S3, U3, V3, W3, Z3, A4, C4, D4, E4, F4	Oral Test Written Test Performance Test
	10	4. Calculating Punch a. Procedures & Applications 1. Flow Charts 2. Diagrams 3. Panel Wiring a. Addition c. Multiplication	#604-521 S3, Y3, F4	Oral Test Written Test Performance Test

Eastern Montgomery County Area
Vocational-Technical School
175 Terwood Road
Willow Grove, Penna.

TOPICAL OUTLINE

INSTRUCTIONAL AREA Scientific Data Processing

Page 4 of 4

YEAR: 1st ____ 2nd X

MAJOR UNITS	CLOCK HOURS	SPECIFIC SKILL DEVELOPED IN TERMS OF JOB REQUIREMENTS	INSTRUCTIONAL AIDS EQUIPMENT, TEXTS OR OTHER TEACHING AIDS	EVALUATION OF PROGRESS AND ACHIEVEMENT
IV Cont'd	10	5. Document Originating Machine a. Procedures & Applications 1. Flow Charts 2. Diagrams 3. Panel Wiring a. Reproducing & Comparing b. Gang punching & Comparing c. Mark sense punching d. END printing & Summary punching	#519 B3, X3, B4, F4	Oral Test Written Test
	30	6. Accounting Machine a. Procedures & Applications 1. Flow Charts 2. Diagrams 3. Panel Wiring a. Detail Printing b. Group Printing Forms c. Control & Skipping with Control carriage	#402 03, P3, T3, F4 Process Sheet Layout Sheet Data Sheet (See Sample)	Oral Test Written Test (Sample Attached) Performance Test

EXHIBIT 2

SCHOOLS REPORTING SEPARATE DATA PROCESSING COURSES FOR DPESP

Junior-Senior High Schools (8)

Brookville Area
Brookville, Pennsylvania

Eisenhower
Russell, Pennsylvania

Elizabethtown Area
Elizabethtown, Pennsylvania

Montrose Area
Montrose, Pennsylvania

Peters Township
McMurray, Pennsylvania

Ridgway Area
Ridgway, Pennsylvania

Solanco
Quarryville, Pennsylvania

Wyalusing Valley
Wyalusing, Pennsylvania

Senior High Schools (31)

Abington
Abington, Pennsylvania

Abington Heights
Clarks Summit, Pennsylvania

William Allen
Allentown, Pennsylvania

Altoona Area
Altoona, Pennsylvania

John Bartram
Philadelphia, Pennsylvania

Boyertown Area
Boyertown, Pennsylvania

Carrick
Pittsburgh, Pennsylvania

Cedar Cliff
Camp Hill, Pennsylvania

Cumberland Valley
Mechanicsburg, Pennsylvania

Fox Chapel
Pittsburgh, Pennsylvania

Franklin Regional
Murrysville, Pennsylvania

Gateway
Monroeville, Pennsylvania

Haverford
Havertown, Pennsylvania

Hempfield Area
Greensburg, Pennsylvania

Huntingdon Area
Huntingdon, Pennsylvania

Lebanon
Lebanon, Pennsylvania

Marple Newtown
Newtown Square, Pennsylvania

McKeesport Area
McKeesport, Pennsylvania

Mt. Lebanon
Pittsburgh, Pennsylvania

Olney
Philadelphia, Pennsylvania

Pennsbury
Fairless Hills, Pennsylvania

Senior High Schools continued

Plymouth-Whitemarsh
Plymouth Meeting, Pennsylvania

Schenley
Pittsburgh, Pennsylvania

Sharon
Sharon, Pennsylvania

Shikellamy
Sunbury, Pennsylvania

South Philadelphia
Philadelphia, Pennsylvania

State College Area
State College, Pennsylvania

Wellsboro Area
Wellsboro, Pennsylvania

West Mifflin North
West Mifflin, Pennsylvania

Westmont Hilltop
Johnstown, Pennsylvania

Wissahickon
Ambler, Pennsylvania

Vocational-Technical Schools (19)

Altoona Area
Altoona, Pennsylvania

Bethlehem Area
Bethlehem, Pennsylvania

Bok Area
Philadelphia, Pennsylvania

Bucks County
Fairless Hills, Pennsylvania

Carbon County Area
Jim Thorpe, Pennsylvania

Central Chester County Area
Coatesville, Pennsylvania

Central Westmoreland Area
Youngwood, Pennsylvania

Centre County
Bellefonte, Pennsylvania

Connelley
Pittsburgh, Pennsylvania

Murrell Dobbins Area
Philadelphia, Pennsylvania

Eastern Montgomery County Area
Willow Grove, Pennsylvania

Eastern Northampton County
Easton, Pennsylvania

Fayette County Area
Uniontown, Pennsylvania

Lawrence County
New Castle, Pennsylvania

Lenape Area
Ford City, Pennsylvania

Mastbaum Area
Philadelphia, Pennsylvania

Scranton
Scranton, Pennsylvania

Steel Valley Area
West Mifflin, Pennsylvania

Wilkes-Barre City Schools' Computer Cente
Wilkes-Barre, Pennsylvania

Two-Year Colleges (14)

Bucks County Community College
Newtown, Pennsylvania

Butler County Community College
Butler, Pennsylvania

Community College of Allegheny County
Pittsburgh, Pennsylvania

Community College of Allegheny County - Allegheny Campus
Pittsburgh, Pennsylvania

Community College of Beaver County
Freedom, Pennsylvania

Community College of Philadelphia
Philadelphia, Pennsylvania

Harrisburg Area Community College
Harrisburg, Pennsylvania

Lehigh County Community College
Allentown, Pennsylvania

Montgomery County Community College
Conshohocken, Pennsylvania

Northampton County Area Community College
Bethlehem, Pennsylvania

Pennsylvania State University - Behrend Campus
Erie, Pennsylvania

Pennsylvania State University - Schuylkill Campus
Schuylkill Haven, Pennsylvania

Pennsylvania State University - Shenango Valley Campus
Sharon, Pennsylvania

Pennsylvania State University - Wilkes Barre Campus
Wilkes Barre, Pennsylvania